

Scanning - Shortwave - Ham Radio - Equipment
Internet Streaming - Computers - Antique Radio



Monitoring Times

A Publication of Grove Enterprises

Volume 27, No. 11
November 2008

U.S. \$5.95
Can. \$5.95
Printed in the
United States

The 2008 Political Conventions

- Frequency Coordination
- Federal and Military Communications

FREE MT OFFER!
See page 61



Also in this issue:

- Fall-Winter Propagation Forecast
- Looking for Football?
- Crisis Monitoring

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WiNRADiO WR-ACD-1800 HF-VHF/UHF Dual Antenna Combiner

The WR-ACD-1800 Dual Antenna Combiner is designed to provide a quick and easy solution to a common problem, connecting separate HF and VHF/UHF antennas to a single-input scanning receiver. It also contains Bias 'T' circuitry to provide DC power injection for active antennas.

WiNRADiO WR-DASP-2500 Dual-Action Surge Protector

The WR-DASP-2500 coaxial surge protector is designed to protect the receiver antenna input against damage caused by electrostatic discharge. This is achieved by a combination of two protective elements: a fast-acting semiconductor device and a gas-discharge tube.

WiNRADiO WR-UBF-1800 Universal Broadcast Filter

The WR-UBF-1800 Universal Broadcast Filter is a user-definable bandstop AM or FM broadcast filter or attenuator making it possible to filter out strong local broadcast stations interfering with reception or overloading a receiver.

WiNRADiO WR-BT-650 HF/VHF Power Injector (Bias 'T')

The WR-BT-650 Power Injector (Bias 'T') provides a means of injecting DC power in a coaxial cable, to power remotely-located devices. It features a very flat frequency response, and a wide frequency range, from 20 kHz to 650 MHz.

WiNRADiO WR-BT-3500 VHF/UHF Power Injector (Bias 'T')

The WR-BT-3500 Power Injector (Bias 'T') provides a means of injecting DC power in a coaxial cable, to power remotely-located devices such as active antennas, low-noise amplifiers and downconverters. This device can be used in a wide frequency range, from 50 to 3500 MHz.

WiNRADiO WR-LNA-3500 Low Noise Amplifier

The WR-LNA-3500 Low Noise Amplifier is an ultra-low noise figure preamplifier designed to operate in the range of 30-3500 MHz. It employs the latest Silicon Germanium Heterostructure Bipolar Transistor technology (SiGe HBT) to achieve excellent performance.

WiNRADiO WR-DNC-3500 Frequency Downconverter

The WR-DNC-3500 Downconverter contains a high-stability local oscillator, mixer and filters to convert an incoming frequency range of 1700-3500 MHz down to 0-1800 MHz which can extend the frequency range of VHF/UHF receivers.

WiNRADiO WR-LWA-0130 Long Wire Adaptor

The WR-LWA-0130 Long Wire Antenna Adapter is designed to work on medium and short wave bands, covering a frequency range from 0.1 to 30 MHz. It is especially suitable for use with WiNRADiO shortwave receivers, such as the WR-G303 or WR-G313 series of receivers.

WiNRADiO WR-CMC-30 Common-Mode Choke

The WR-CMC-30 provides a means of reducing or eliminating common-mode noise from an antenna feedline (generated by computers, lamp dimmers and other electric or electronic appliances), resulting in a considerable increase of the received signal quality.

Monitoring Times

Vol. 27 No. 11

November 2008



Sorting Out the Spectrum

Chris Parris

While rock concerts, NASCAR races, and large sporting events are a challenge for radio frequency coordination, the 2008 political conventions a few short months ago were about as complicated as it gets. Only the up-coming presidential inauguration comes close.

For an overview of the issues involved and how they are handled by the Political Conventions Communications Committee and the FCC, turn to page 10.

For loggings of active frequencies and tentative identifications, turn to the *Federal File* column on page 54.

C O N T E N T S

107 Years of WCC Cape Cod 12

By John Catalano

A significant first step in global communications, WCC, the Marconi station at Cape Cod, Massachusetts, was active from 1901 to 1997. Portions of the station's second site in Chatham still stand, and the Chatham Marconi Maritime Center proudly exhibits the site's extensive history and even operates amateur radio station WA1WCC. Visit soon: Interest in oceanview property is always in competition with historical preservation.

Fall-Winter Propagation Outlook..... 16

By Tomas Hood

Enquiring hobbyists want to know: What's the bottom line? Will Cycle 24 be boom or bust? In addition to addressing this pressing question on everyone's mind, Tomas Hood not only provides some reassurance that all is normal, but he "busts" some other myths as well.

Join the Digital Revolution

For a limited time, Grove and *Monitoring Times* are offering a **free 3-month** trial of *MT Express* (1 per customer) with **any** Grove purchase or *MT* subscription. It's the new way to experience your radio hobby, with live links to websites, streaming audio, email addresses, and more. See www.grove-ent.com or www.monitoringtimes.com for details.

Reviews

"It tunes shortwave, AM, FM and Weatherband with NOAA Alert mode; it's powered by a built-in hand crank, rechargeable batteries or solar panel. It's positively 'green.' Wait a minute, it *is* green!" It's Kaito's Voyager KA500, reviewed by Ken Reitz on page 70.

Believe it or not, there are some times when you actually want to *reduce* incoming radio signals, and one does this by use of an attenuator. To be most useful, an attenuator should be adjustable. Bob Grove discovered a nifty step attenuator kit from the Xtal Set society, which he reviews on page 71.

Borrowing a trick from fighter pilots,

where critical functions are located on the control stick, JoyToKey converts keyboard strokes to a joystick for flight simulation programs. As he suspected, Dr. Catalano confirmed that the program can also shift your most-used *radio control* functions to a joystick, thus liberating you from the keyboard! (See page 72)

While not a single-product review, you'll also want to check out "Tracking the Elusive FM HD Signal" on page 66. Ken Reitz conveys the results of his experience trying to get the best reception of digital radio. He evaluates several receivers, antennas, amplifiers, and techniques for digital FM reception.



MONITORING TIMES
(ISSN: 0889-5341;
Publishers Mail Agree-
ment #1253492) is
published monthly
by Grove Enterprises,
Inc., Brasstown, North
Carolina, USA.

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Periodicals postage paid at Brasstown,
NC, and additional mailing offices. Short
excerpts may be reprinted with appropri-
ate credit. Complete articles may not be
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Brasstown, NC 28902-0098
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Internet Address: www.grove-ent.com or
www.monitoringtimes.com
Editorial e-mail: editor@monitoringtimes.com
Subscriptions: order@grove-ent.com

Subscription Rates: \$28.95 in US; \$39.50
Canada; and \$58.50 foreign elsewhere,
US funds. Label indicates number of is-
sues left. Renewal notice is cover sheet 3
months before expiration. See page 77
for subscription information.

Postmaster:
Send address changes to *Monitoring Times*,
7540 Highway 64 West, Brasstown, NC
28902-0098.

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Times* or Grove Enterprises. Unsolicited
manuscripts are accepted. SASE if material
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AM Band



Receives
FM Band



Receives
Shortwave Band



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Satellit 750

AM/FM/Shortwave Radio with SSB | \$300.00

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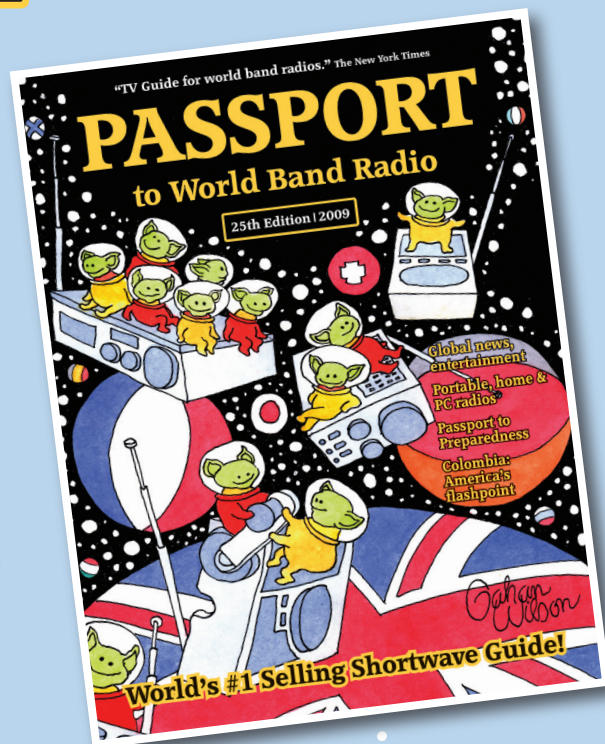


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PASSPORT'S frequency-by-frequency Blue Pages section is almost a book by itself. This quick-access guide offers specifics for each of the world's stations—frequencies, times, days, locations and powers. Also, target zones, network affiliations, languages and even if there's jamming.

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PASSPORT'S program guide, "What's On Tonight," builds on this with hour-by-hour descriptions of news, music and entertainment shows in English. Station contacts and web simulcasts? PASSPORT'S "Addresses PLUS" is the industry bible, crammed with juicy tips. Also, Colombia's radio history and its role in the ongoing war against narcoterrorism.

PASSPORT REPORTS tests, evaluates and rates dozens of the latest portable, PC controlled, professional, tabletop and emergency receivers—outdoor and indoor antennas, too. *Outside* magazine minces no words, "The best. They tell you what's good about the good, bad about the bad, and advertisers be damned."

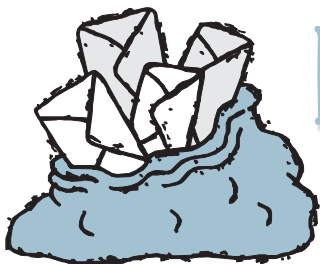
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LETTERS TO THE EDITOR

Three Free Issues
With your renewal or subscription to *Monitoring Times* or ANY purchase from Grove Enterprises before Jan 1, you will be awarded three free months of *MT Express*, the online, active version of *MT*. See www.monitoringtimes.com for details or call 1-800-438-8155.

Welcome to a New Columnist

After launching our GlobalNet column about "radio" broadcast by means other than airwaves, Larry Van Horn has turned the column over to the person who best understands our vision for the column: his son, Loyd Van Horn. Loyd made his debut in *Monitoring Times* many years ago, but reappeared last month as author of the comprehensive feature article on alternative ways to "tune in" the BBC.

As noted in that article, Loyd has experience in broadcasting and journalism, is a trained storm spotter, and holds amateur radio license W4LVH, among other interests. Please welcome him and let him know your favorite sites for streaming audio of any genre. Or, ask him for help if you're having trouble getting a handle on this new media or if you can't find an audio source for something you'd really like to hear. We'll try to help.

Feedback Bletchley Park

Bill Grove discovered a news item at http://news.cnet.com/8301-1009_3-10034884-83.html after our October cover feature on Bletchley Park was already printed. The Bletchley Park Trust is launching a campaign to raise money to help preserve the buildings at the historical site, whose war-time work helped lay the foundations of modern computing and cryptography.

The National Museum of Computing receives no external funding, having been turned down for both National Lottery and Bill & Melinda Gates Foundation funds. The Bletchley Park Trust relies on visitors (which have increased by 40 percent in the last two years), event hosting, and donations to run the park. Its goal is to make it into a world-class heritage site and educational center.

WBCQ

"As I was reading *Monitoring Times* today I came across an error that I thought I should advise you of in the September 2008 issue. I see on page 12 and 13 there are two captions

that are the same that say 'Goddess Irena is one of the many characters who find a home on WBCQ.' I see this caption is probably aimed at the picture of Irena on page 12 not on page 13.

"Well, keep up the great work. I love the magazine and have been reading it for a number of years. Take care and 73's...."

David Havarar-KA3ZJW

Thanks, David! We noticed the incorrectly-captioned picture of WBCQ's transmitter (caused by last-minute reformatting of the article) after the issue went to press. We figured WBCQ would get a kick out of it and might even rename the transmitter - We probably owe an apology to Goddess Irena, though!

More Canadian Content?

"...as an old in the tooth journalist, one of the things I like about *Monitoring Times* is the professional manner in which it's presented. Perhaps more Canadian content needed?"

George Clogg

Thanks for the kind words, George. Sure, we'd appreciate more Canadian content, but we depend upon the submittals from our northern neighbors for that information. We do employ two Canadian staff members, whose columns regularly include Canadian content. But Canadian features and news items are always welcome!

RCA Historical Station

In June 2006, *MT* published a radio tour of Belfast, Maine, written by Bob Fraser. In the past two years, community interest and research by the Belfast Historical Society has uncovered more details about the nearly-



forgotten remains of an old RCA radio station. Bob Fraser sent along an updated brochure on the historic station.

I bring this up now, because this month, John Catalano visits the historic Marconi station WCC, which was eventually acquired by RCA. The WCC Chatham site was constructed in 1914. The Belfast RCA site was apparently

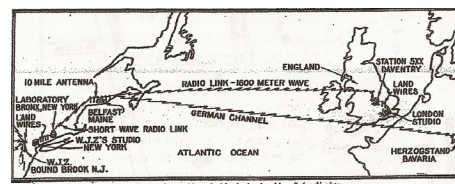
acquired around 1920 and the station built within a few years of that. It operated as a relay station for WJZ in New York.

On March 14, 1925, the Belfast station made history when it received and relayed the first live, trans-Atlantic, long wave radio broadcast from station 2LO in London, England. The broadcast includes announcer Milton Cross breaking into the dance band from London's Savoy Hotel to excitedly comment on the record-setting nature of the broadcast. You can hear a recording of the historic broadcast at The Belfast Museum on 10 Market Street.



Although the station was shut down in 1929, the antennas dismantled, and the building abandoned, concrete antenna bases and guy-wire anchor bases are harder to erase. Many have been located and signposts erected, and the museum has mapped an 11-stop self-guided walking tour. You can pick up the free map brochures in the entryway of The Belfast Museum.

The circa 1921 illustration below bears the caption, "*Transoceanic relay of international broadcasting planned for radio fans this winter.*"



This column is open to your considered comments. Opinions expressed here are not necessarily those of Monitoring Times. Your letters may be edited or shortened for clarity and length. Please mail to Letters to the Editor, 7540 Hwy 64 West, Brasstown, NC 28902 or email editor@monitoringtimes.com
Happy monitoring!
Rachel Baughn, Editor



COMMUNICATIONS

by Ken Reitz

SHORTWAVE/AMATEUR RADIO

SWLers Invited to NASB/DRMUSA Meeting

The next annual meeting of the National Association of Shortwave Broadcasters and Digital Radio Mondiale USA will be held May 7-9, 2009 in Nashville, Tennessee. According to Jeff White, NASB president, shortwave listeners and DXers are invited to attend and participate in the three day event. Those wishing to attend must pay their own transportation and hotel accommodations.

Events at the NASB meeting are free, though you must pre-register if you plan to attend because space is limited. A few NASB meetings are closed to non-members, but many events, including a tour of WWCR's studio and transmitter facilities and special lunches and coffee breaks (made possible by corporate sponsors) are open to all attendees. Meetings will take place at the Holiday Inn Express in downtown Nashville, near famed "Music Row," which is offering special convention rates for attendees. For more information on the NASB meeting go to www.shortwave.org/meeting.htm. To pre-register contact: nasbmem@rocketmail.

VoA to Axe Hindi Service

The Voice of America has ended its shortwave broadcasts of the Hindi language

service to India. According to an article in the *Washington Post* from September 12, some 8 million regular listeners in India will lose this vital source of information about events from around the world and their own country. Ignoring the fact that shortwave radio still plays a substantial role in the lives of many on the Indian subcontinent, and that many remote regions are not served by either Internet or satellite TV, VoA cut programming at the end of September.

The *Post* article said there are dozens of VoA listening clubs throughout India and that, while the BBC so far continues its service, listeners preferred the clearer signals from VoA. Listeners also preferred the timely news and popular call-in programs to programs on the strictly controlled India government radio service.

Alaska DRM Project under Construction

A report in *Radio World On-line* said that construction began earlier this fall on Digital Aurora Radio Technologies' DRM transmitter site located 130 miles southeast of Fairbanks, Alaska. The company has FCC authorization to test DRM transmissions on 5, 7 and 9 MHz for the next two years with up to 100 kW of power. The report said that actual testing is scheduled to begin next spring.

Radio Martí Covers Cuba during Ike

Radio World Online reported that the Miami-based and State Department funded Radio Martí provided extensive coverage to listeners in Cuba during the devastation dealt by hurricane Ike which scraped along the entire country of Cuba in early September. Taking advantage of relaxed cell phone rules in Cuba, the station claimed one listener was calling in from atop a water tank to thank the station for its coverage.

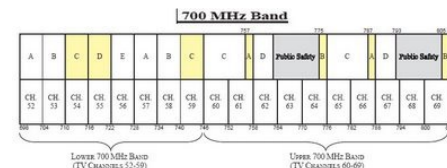
WRN goes DAB+ in Malta

World Radio Network, which rebroadcasts programming from selected international broadcasters on a variety of media throughout the world, plans to transmit in the Maltese Islands using a terrestrial Digital Audio Broadcasting (DAB) network, according to a report in *Radio World Online*. It will be the first such terrestrial network in Europe utilizing DAB+ technology.

PUBLIC SERVICE

FCC to Rerun 700 MHz Auction

Last spring the FCC attempted to auction off parts of the upper 700 MHz band of the former UHF-TV band (channels 60-69) for a nationwide radio system for first responders. The auction didn't produce a winning bid, so the FCC will try again. This time, according to an article in the *Washington Post*, the FCC has lowered the reserve bid from \$1.3 billion to \$750 million and extended the deadline to finish the network an extra five years to 15 years total.



County opted out of the project, pushing plans to develop its own digital service.

WV Digital System Crashes

A report in the *Charleston Gazette* September 1 reported that a new \$50 million digital radio system quit working for five hours and that none of the 100 digital fire or police radios could function during that time. The problem, according to the article, was a faulty computer cable. Police and fire services switched to the old analog system while the new system was down. The manufacturer of the failed digital system was not noted in the report.

Is this Frequency in Use?

The *Dallas Morning News* reported August 29 that several radios stolen from a Dallas fire station may have been used by the thieves to break into local police frequencies, creating on-air hassles for real police. Once it was apparent that the "dispatchers" were fakes, police switched to a more secure channel.

BROADCASTING: TV, RADIO, SATELLITE

DTV Passes first Crucial Test in NC

Earlier this year, the FCC selected Wilmington, North Carolina, as its guinea pig to test the shut-off of analog TV transmitters and go strictly digital off-air. The September 9 date with digital destiny had been widely publicized, and the FCC threw all its resources behind the effort to make a smooth transition.



According to a news release from the FCC, "the vast majority of the 400,000 television viewers impacted by the change were aware of the transition and seemed prepared for it." FCC chairman Kevin Martin was quoted as saying, "The results of the digital television switch in Wilmington shows that the collective efforts of the Commission, the community and industry to inform viewers of the early transition in this local market were effective." The statement said that some 28,000 converter box coupons were redeemed during the switch.

Of the 180,000 estimated households in the Wilmington market, some 14,000 receive over-the-air television programming with roof-top antennas or rabbit-ear antennas according to the FCC news release. The release stated that less than one-half of one percent of area homes called the FCC helpline asking questions and seeking help with the switch-over on the first day. That number was cut in half the second day.

Of the nearly 800 calls fielded by the FCC hotline on the first day, less than 200 had re-

ception or technical problems; 232 complained about not being able to receive Wilmington signals. Only nine who called said that they were not aware of the switch to DTV, five said they were not aware of the correct transition date, and nine said they didn't think the stations they watched would switch to digital. Twenty-four callers admitted they forgot to upgrade; 31 procrastinators said they waited too long to buy or set up a converter box.

HD Digital Radio Alliance

Three years ago, there were only a handful of radio stations transmitting the HD Radio digital format and virtually no reception equipment available at any retailers nationwide. Now, according to the HD Digital Radio Alliance, a joint initiative of leading radio broadcasters, 1,750 HD Radio stations are on the air with more than 800 offering HD2 and HD3 multicasts; more than 60 HD Radio receivers are on the market in more than 12,000 retail outlets.

The Alliance looks to add "innovative data services such as real-time traffic and location-based services" while continuing niche content on HD2 and HD3 channels with the possibility of premium content being available on a receiver-by-receiver basis.

New Network via HD Radio

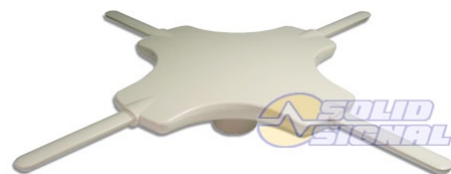
A press release from Emmis and World-Band Media in September announced the development of a digital radio network with programming aimed at the millions of people in the U.S. from South Asia. Emmis is an Indianapolis-based media company that owns 21 FM and 2 AM outlets in the U.S., many in the largest U.S. markets.

The company offers programming that can be rebroadcast on an HD2 or HD3 channel in markets where a large South Asian community already exists. Such programming has been launched on WQHT-HD3, New York, KPWR-HD3, Los Angeles, and WLUP-HD3, Chicago. The launch of this national network could serve as a template for similar networks to utilize the second and third channels made possible by HD Radio's multicast technology.

If They Build it, Can You Use it?

Japan-based DX Antennas is now making available a "smart" antenna for UHF/VHF HDTV reception. The antenna, DTA-5000, looks like a turnstile antenna, but has circuitry which, when connected to a compatible converter box, automatically adjusts the gain and directionality of the antenna to whichever channel the converter is tuned.

The DTA-5000 has a built-in low noise amplifier and automatic gain controller and does not require a rotator. The antenna, which measures 4.5" high and 28.9" wide, is available



New Directional 'HDTV' Antenna without Rotator (Courtesy: SolidSignal.com)

from www.solidsignal.com for \$89.99 plus \$10.95 shipping.

But, the DTA-5000 can only be used with ATSC converters that have the smart antenna feature conforming to the EIA/CEA-909 standard interface. While these antennas aren't new, having been introduced in 2002 at the Consumer Electronics Association show, the problem seems to be a lack of compatible DTV converters. But, that hasn't stopped other antenna manufacturers, looking to get in on what they hope will be a good thing. St. Louis-based Antennas Direct and AudioVox are said also to be developing "smart" antennas with CEA-909 capability, but as yet neither have a product available at this time.

FCC ENFORCEMENT

Religious Broadcaster Hit with Fine

New Kensington, Pennsylvania religious broadcaster, Pentecostal Temple Development Corporation, licensee of WGBN (1150 kHz), was hit with a total of \$15,000 in fines for a variety of infractions, including having only one standing tower which made the signal omnidirectional. Unfortunately, their license is for a directional signal. They were also flagged for not having their public files up to date; transmitting on an unauthorized studio transmitter link frequency, and operating at unapproved power levels for night and daytime operations.

Starfish not a C-band Pirate: FCC

Utah-based Starfish Television Network has been operating a C-band satellite transmitter without authorization, according to an FCC Notice of Apparent Liability for Forfeiture. But, the FCC concluded after investigation that the company the network contracted to build the uplink facilities and deal with the FCC paperwork had not done its job. Still, there's no hiding place, and the FCC exacted a \$5,000 fine on the religious broadcaster.

Fines for Shipping Non-compliant TV Sets

Part of the roll-out of the DTV switch included deadlines for the sale of TV sets without DTV reception capability, after which fines would result for the offending companies. In a Notice of Apparent Liability for Forfeiture from August 26, the FCC slapped Hannspeer North America, an electronic import company, a \$12,450 fine for shipping some 249 non-compliant sets to various customers nationwide. Invision Industries, Inc., a Florida-based company specializing in rear seat TV sets, was similarly found to be selling out-of-date, non-compliant tuners. An initial \$324,000 fine was reduced to \$4,000.

"Communications" is compiled by Ken Reitz KS4ZR (kenreitz@monitoring-times.com) from news clippings and links supplied by our readers. Many thanks to this month's fine reporters: Anonymous, David Alpert, Rachel Baughn, Bob Grove, Norman Hill, Tom Hirsch, Larry Van Horn, Brian Rogers, David Whitten.

Sorting Out the Spectrum

Radio Frequency Coordination at the 2008 Political Conventions

By Chris Parris

What do political conventions, presidential inaugurations, NFL football telecasts, big music concerts, NASCAR races and golf tournaments have in common? These events mean plenty of news media or television broadcast coverage and that can require a huge number of radios and wireless audio devices. And, in order to prevent electronic chaos and interference issues, there is usually some form of frequency coordination and enforcement at these events.

Any time you have a large number of news media and production crews in one location for any event, there are certain to be many different types of wireless devices in use – everything from wireless microphones, wireless earpieces (called an “IFB,” which stands for Interruptible Fold Back) and even radio frequency control for wireless camera systems. And the two political conventions held recently in Denver and Minneapolis/St. Paul proved to be no exception.

Advance Coordination and Planning

While the Federal Communications Commission is the agency in charge of licensing the public radio frequency spectrum, many of the RF devices used by broadcasters and the news media are low-powered and under FCC Part 15 regulations, allowing use without an FCC license. And in unusual cases, such as the political conventions, the FCC authorizes some temporary use of specific frequencies or bands

of frequencies for the duration of these special events.

In order to prevent confusion and harmful interference to licensed users, groups of engineers in the broadcasting and communications industries often come together to form volunteer organizations to help organize and enforce some order in the use of transmitting devices at large media events. The Political Conventions Communications Committee or POLCOMM was the responsible group for coordination of radio frequency equipment and systems in the two convention cities in 2008.

During the months prior to the conventions, news media and production companies that were planning on working at the political conventions were encouraged to apply for RF coordination via a web site or email. Users requested RF channel space be set aside for the various RF emitting devices they were planning on bringing to the convention coverage.

One of the many challenges for the POLCOMM group was the shrinking RF spectrum available for wireless devices at the conventions. Many wireless audio devices used by the news media and broadcasters operate in what are called “white spaces” or the frequencies in vacant TV channels. With the transition to digital television broadcasting underway, many TV broadcasters are operating on both their analog channels *and* their new digital channels. This makes the number of available, empty TV channels even fewer than in years past. Due to this shrinking spectrum, literally hundreds of



requests for wireless microphone systems had to be turned down, due to lack of radio spectrum.

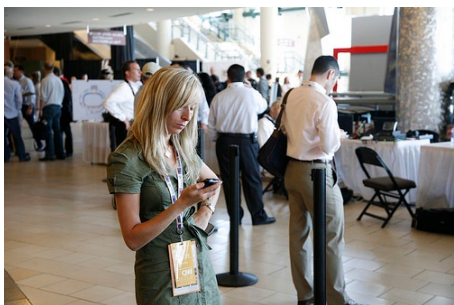
Planning for Problems

The enforcement of the frequency coordination falls to POLCOMM and a small army of volunteers. These RF enforcement teams are often from local area broadcasters and usually members of the Society of Broadcast Engineers, or SBE. SBE has voluntarily taken on the task of doing frequency coordination for NFL telecasts and other large media events across the country. The FCC was also present at both political conventions; however, they were not there to enforce the coordination of wireless devices, but to protect licensed users of existing frequencies and to assist in resolving issues involving licensed users.

Just prior to the conventions, test periods were scheduled to allow everyone to use their RF systems and see if there were any interference issues. Fortunately, due to the skill and organization of the POLCOMM group, very few interference issues were found. In some cases, users had to be moved to alternate frequencies, and some users were found to be on the wrong frequencies.

Even with all of the advance planning and preparation, some new crews showed up at the conventions with equipment that was neither frequency coordinated nor cleared for use at the event sites. In these





cases, members of POLCOMM would have to check out what the RF equipment was going to be used for and what frequencies it could operate on. They would then see if there was any available spectrum for these devices to safely operate. If so, the users were cleared to bring the gear in and use it.

Louis Libin, president of Broad Com and chairman of POLCOMM explained that in St. Paul at the Xcel Energy Center, they started out with over 1000 small stickers that were to be attached to the antennas of all approved equipment that was allowed in the facility. By Thursday afternoon, the last day of the convention, they had pretty much run out of the stickers.



Additional Challenges

At both convention sites and at Invesco Field in Denver, there were wireless camera systems deployed to provide close-up coverage from the arena floor. These systems also presented a challenge to frequency coordinators, as many of these systems utilize 2 GHz microwave paths for the video from the camera to the production trucks. The 2 GHz and the new 2.5 GHz BAS (Broadcast Auxiliary Service) bands are already getting crowded with local TV news operations and studio to transmitter links. Careful planning and testing helped avoid interference issues with microwave frequencies, and some of the microwave links were allowed to use different frequency bands on a temporary basis.

Another major challenge to the POLCOMM group in Denver was having to not only coor-



dinate frequencies for use at the Pepsi Center, the primary site for the DNC, but also having to coordinate the events at Invesco Field on the last day of the convention. Fortunately, as it turned out, the RF environment of the Pepsi Center and Invesco Field were very similar and did not require any new or different frequency assignments.

In addition to the local and national new media, other users included various international news and broadcast operations. In many cases, their standard radio equipment for such events was not compatible with the frequencies and spectrum utilized here in the United States. (This can be a major headache when coordinating international events such as the Olympics.)

Protection and Enforcement

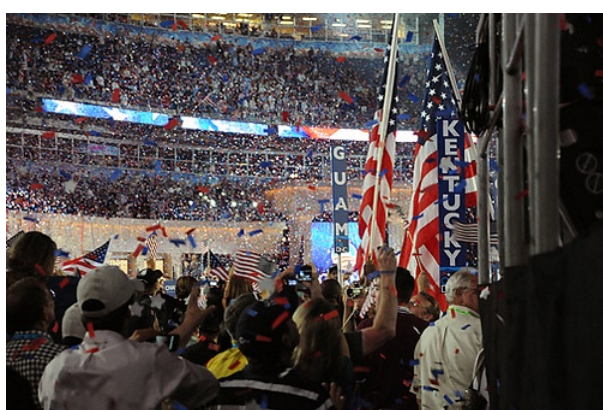
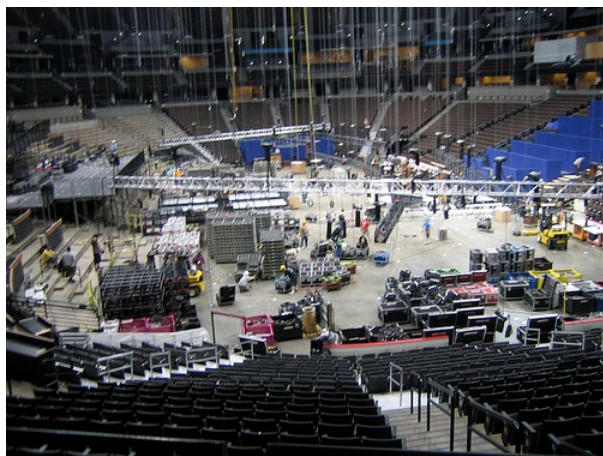
One goal of frequency coordination at such major events is to protect the frequencies in use by local broadcasters and businesses. Any interference with FCC licensed operations is strictly prohibited and is to be avoided at all costs. In case of interference issues, users were to contact the members of POLCOMM to help resolve the problem. In both convention sites, POLCOMM set up radio repeaters to be used for reporting and resolving issues. It was sometimes convenient to have multiple users talking to each other, so that various combinations of frequency changes or turning transmitters off could be tried to locate the source of the problem.

One of the enforcement tools the coordinating group used were warning signs posted at the entrances to the secured areas. People entering were warned that all RF transmitting or receiving equipment entering the facility had to be checked and tagged with a small sticker on the antenna. While the Pepsi Center in Denver used SBE volunteers for this duty, the POLCOMM groups had to train the security personnel manning the entrances to spot unmarked RF gear.

And why prohibit receivers? Because in most cases, if a news crew comes in carrying a camera-mounted wireless microphone receiver, they most likely have the transmitter that goes with it. And if both parts of the system weren't checked and tagged, they are not welcomed into the facility.

Another tool that the POLCOMM enforcement teams had at their disposal was an array of electronic monitoring and surveillance gear to detect and locate any interfering signals in the convention venues. Direction finding equipment, spectrum analyzers and near-field monitoring receivers help the enforcement teams find and eliminate interference issues.

In some cases, the interference was coming



from sources outside the venues from equipment over which POLCOMM had no control. In those cases, the users were simply moved to another frequency to minimize or eliminate the interference problem.

Where to Search

In both Denver and St. Paul, the FCC allowed the temporary use of portions of the UHF "T" band that runs from 470 MHz to 512 MHz for land mobile radio communications. Systems used in Denver and St. Paul included both simplex and repeated channels. Wireless microphones, intercoms and IFB systems are usually low powered and do not require FCC licenses, but because there were so many systems and a limited number of available frequencies, voluntary coordination is more practical and enforceable than FCC licensing.

From the perspective of those monitoring these events from the outside, what does all this mean? First, don't limit yourself to standard bands in searching for active frequency spectrum. Chances are that there will be plenty of new frequencies in use and on frequencies where you may never have heard activity before. You may hear radios using unusual frequency ranges that will be used only for the duration of the event. For government and military frequencies that were found to be in use for security during the conventions, see this month's *Fed Files* column.

Check out which television broadcast channels are in use in your area and, if your receiver is capable, search through the un-used channel spaces. You may be surprised what you find there!

MT



First Steps toward Global Communications

107 Years of WCC Cape Cod

By Dr. John Catalano

Since recently retiring (for the third time), my wife and I travel whenever possible and affordable. It remains her goal in life to see “everywhere in the world.” And we have done just that over the past seven years.

In some ways it seems like a busman’s holiday for me, since I did a lot of international traveling during my 30-year career in the electronics industry. However, I assure you that seeing countries such as China and Greece as tourists together is very different than seeing it as a rushed business exec. Now we take it slow and immerse ourselves in all the details of the country and cultures. It’s amazing how much of the local experience I had missed. Case in point: one place right here in our own country, in Cape Cod, Massachusetts.

On a few occasions, when I was in Boston on business, I “ran out” to Cape Cod for the “cape experience.” However, this spring we decide to just spend some “easy time” on the Cape. We chose the perfect Carriage House Inn in the beautiful village of Chatham to be our base of exploration.

Chatham sits on the southeast coast of the Cape Cod and is surrounded by miles of pristine beaches. In Figure 1, Chatham is on the lower right by the star with the “A”. But Chatham is much more to radio buffs. Chatham has played an important role in radio history over the past 100 years. So this time I did some modern archeological radio “digging.”



Figure 1 - Map of Cape Cod, Massachusetts. Note Chatham “A” Star and South Wellfleet “B” Star. Courtesy Mapquest

“Wireless” History

Nearly 108 years ago, on December 12, 1901, a very weak signal letter “S” was transmitted from Poldhu, England, and was received at Marconi’s Newfoundland station. It was a bit of publicity

stunt, since it provided no actual communication and it was the shortest distance across the Atlantic. However, this singular event proved the transatlantic wireless communications concept. It ushered mankind into the radio age.

Spark-gap transmitter/receiver stations were subsequently constructed in a number of sites on the coasts of the Atlantic, including Poldhu, Cornwall, on the western coast of England and, in the USA, at a beach in South Wellfleet on Cape Cod Massachusetts. Wellfleet sits about twenty miles due north of our base in Chatham, as can be seen in Figure 1 at the star with the “B” at the upper right.

Getting the stations operational proved a problem on both sides of the Atlantic. Construction of the Wellfleet antenna and facilities was begun in 1901. But in September of that year, a storm wrecked the Poldhu site. Then, in November of 1901, a storm destroyed the antenna system at the Wellfleet site!

New construction at both sites replaced the flimsy antenna tower supports with solid wooden ones, 210 feet tall and 24 feet at the base. Marconi was determined not to let weather beat him a third time. A scale model of the reconstructed Wellfleet site is shown in Figure 2.



Figure 2 - Scale model of Marconi’s Wellfleet site, operated from 1902 to 1914. Picture of model taken at Wellfleet Beach.

Marconi’s goal of establishing a transatlantic wireless communication network, which could compete with undersea cable, now was dependent on the operation of the Wellfleet station.

Spark Gap Technology

The Wellfleet transmitter was nothing more than a big – no, make that *very big* – spark producer. It was supplied with over 2000 volts of AC stepped up to 20,000 volts. It is said that the electrical

buzz or hum from the station could be heard miles away.

Figure 3 is a circuit diagram of the Wellfleet transmitter. The basic parts of the transmitter were: a *very* large capacitor, a crude antenna-matching network, and the rotary spark-gap motor, also called an alternator. Crude by today’s standards, but it worked!

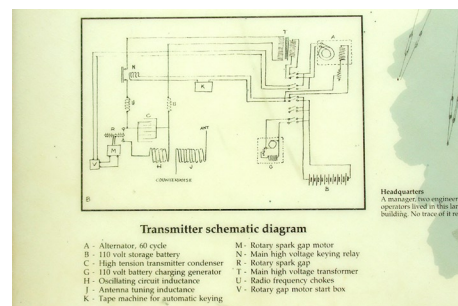


Figure 3 - Schematic circuit diagram of Marconi’s Wellfleet transmitter.

Notice that the transmitter also had a back up battery, labeled B, and a tape machine for automatic keying, labeled K. The auto keying may indicate that this diagram was of a later version transmitter.

History is Really Made

In 1903, the first wireless telegram was sent 3000 miles across the Atlantic from the South Wellfleet station. (See Figure 4 for the plaque that sits today on that Wellfleet Beach.) Transatlantic wireless messages then began to flow on a regular basis. Marconi had come a long way from the day



Figure 4 - Plaque commemorating the first US to Europe wireless communications.

six years before, when he first succeeded in sending radio transmissions across the English Channel, a mere 10 miles.

In 1906, three years after Wellfleet was rebuilt, Marconi's communications business was booming. But, the star-crossed site was again under attack from another natural force: the sea. That year, a civil engineering site survey predicted that if beach erosion continued at its current rate, the site would become unstable and unusable within ten years! (Good thing Marconi was in radio and not real estate.)

For the next ten years, Marconi's empire and radio communications continued to flourish. The importance of the Wellfleet station to his business and to maritime and international radio communications also grew. The station was given the call sign WCC – some say to signify “Wireless Cape Cod” and others say it stood for “Wellfleet Cape Cod.” For a period of time its call was also MCC, Marconi Cape Cod.

However, Marconi was keenly aware that the lifetime of his critically important Wellfleet station was ticking away. By 1914 he had settled on a site that still had an excellent over-water shot for his radio signals, but was a bit more protected from the ravages of the weather and the sea.

A “Permanent” Site

Construction for the new Marconi Wireless Telegraph Company of America station was begun 1914 in Chatham at an inlet called Ryder's Cove. Although only yards away from the Atlantic Ocean, it was protected by the inlet. More to the point, it was on a hill overlooking the beach, instead of directly on the beach, so erosion was no longer an issue.

If Wellfleet is where radio, “learned to walk,” Chatham is where it evolved into a full run and dance. The Chatham facility, in contrast to Wellfleet, was designed and built as a commercial venture. Gone were the two small wooden equipment huts. They were replaced with fifteen buildings, many of brick construction. Chatham was designed as a self-contained, almost self-sufficient complex. Figure 5 is an aerial view of the site at an unknown date. Ryder's Cove, opening to the Atlantic Ocean, lies at the top.

A large operations building, power station, and garage formed the core of the technical buildings. Antenna feed and repair structures were also added. The operations building housed the many radio operators and their equipment, as well as management and repair offices.

With round-the-clock radio operations envisioned, residences for personnel were built. These included a multistoried building for single personnel labeled the “Hotel” (Figure 5) and six homes for married families. The homes for the Station Managers can also be seen.

Learning from Mistakes

As for the Wellfleet's wooden towers, they were replaced at Chatham with six massive steel towers. Marconi had learned a respect for weather and the elements. The towers were over 400 feet tall, an impressive piece of engineering for 1914.

They ran roughly south from Chatham for over a mile. If you look in Figure 5, you can see a line starting near the bottom of the operations

building and going toward the bottom of the picture. This traces the feed-line and gives the general direction of the series of the six original 400-foot antenna towers. They ran toward the village of Harwich as seen in Figure 6.

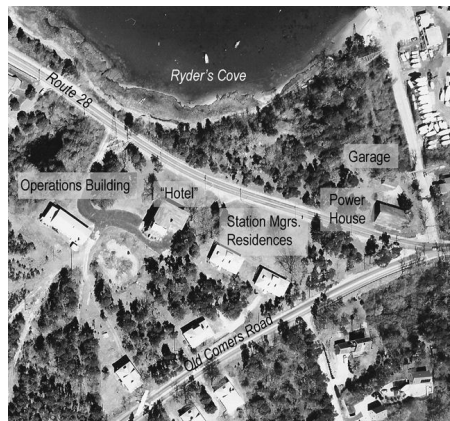


Figure 5 - Aerial view of WCC Ryder's Cove site – date unknown (after 1954).

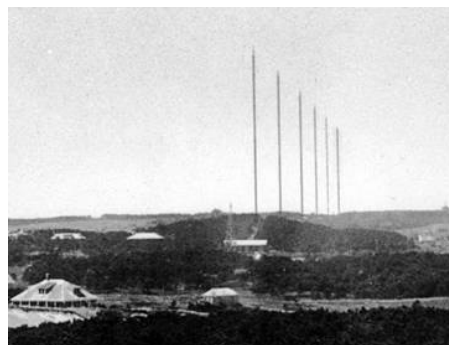


Figure 6 - A 1919 photo showing WCC's six huge towers. The last one was taken down in 1954.

Details Fading with Time

Although originally designed to be both a receiving and transmitting site, people only seem to remember the Ryder's Cove site being used for listening. The transmitter was first located in the town of Marion, 55 miles away on the mainland. In the late 1940s, the transmitter was relocated to Forest Beach in South Chatham, 4 miles away.

However, operators at the Ryder's Cove site controlled the remote transmitter via telephone to the Marion site and later via a radio link to South Chatham. In any case, the total operation of transmission and reception was classified as WCC Chatham.

Within days of becoming fully operational in 1914, Chatham was well on its way of realizing the Company's original goal of it being the US gateway for messages sent from/to European and Scandinavian. But Marconi's plans, both technical and business, would be thwarted by different force. Not of nature this time, but of man.

Overtaken by World Events

In 1917, during World War I, the United States government seized Marconi Wireless Telegraph Company of America assets in the US, fearing a security problem. Chatham became a listening station for the government. But at war's end, the

government was reluctant to return such a critically important industry to “foreign” control.

This was a bit strange, since the Marconi Wireless Telegraph Company of America was a British company. Although Italian by birth, Marconi's financial backing came from English investors via his British mother's family connections. After all, had not England just fought with the USA against Germany during WW I?

It just so happened that in 1919 a number of major US corporations, with the sanction of the US government, formed a new company as a consortium. The new company's singular goal was to exploit and develop radio technology, products, and markets. General Electric, Westinghouse, American Telephone and Telegraph and the United Fruit Company were the major US companies. (Although the United Fruit Company seems an unlikely participant, its business, with plantations all over Central and South America, was critically dependent on long-range communications.)

In 1919, the US government forced the foreign-owned Marconi Wireless Telegraph Company of America to sell controlling interests in its US holdings to the new consortium company. The polite term used was “merger” So it was unceremoniously, goodbye Marconi.

General Electric, Westinghouse and AT&T agreed to grant the new company free access to all of their patents and technologists: a great “dream team” start for any new tech company.

As part of my training at General Electric, I attended many weeks of classes at GE's Crotonville, NY, management training center. In the class on intellectual property (patents and such), we were told the story of how GE helped set up this new company in 1919. However, we were told a part of the story that few get to hear.

The new company, in search of even more money, found a loophole in their legal use of GE technology. The new company began to sell and license GE patents to GE competitors! Their own “child” was destroying GE. As a result, for many years, GE was forced to treat the new company as a hostile competitor and withheld as much emerging new technology as they legally were allowed.

And who was this silver spoon start-up? Sorry, did I forget to tell you? You might recognize it if you are 40 years or older. It was the Radio Corporation of America. That's right, the mighty RCA.

Chatham Becomes WCC

RCA wasted no time in taking control in 1919. The call sign WCC was officially transferred to Chatham in 1920 and within a year it started its now famous career as a Maritime station for ship-to-shore communications. But a technological achievement by their new owner really put WCC Chatham on the radio map. With all the vast technologies of GE and Westinghouse at their disposal, RCA chose to develop vacuum tube technology. This would be their vehicle for producing revolutionary radio technologies and radio products.

In 1921 the rotary spark gap transmitter was scrapped and WCC Chatham became the first maritime owner of a new and powerful vacuum tube radio transmitter. The “ears” for WCC was the tremendous monitoring antenna array at Ryder's Cove as shown Figure 7 from 1922. Now WCC's

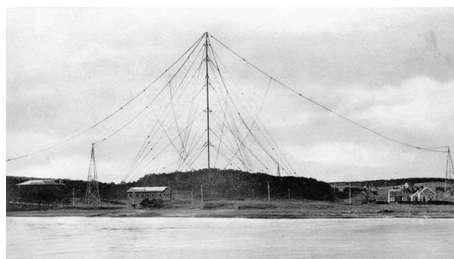


Figure 7 - Ryder's Cove antenna array circa 1922. Notice the smaller towers (three visible in the photo). They still exist today! See Figure 12.

Morse Code signal could reach all over the Atlantic Ocean, into the Mediterranean, and even farther. And its receive capability matched or exceeded that. WCC was the world's powerhouse maritime station.

24/7

WCC operated twenty-four hours a day, three hundred and sixty-five days a year. At times, ten operators on three shifts continuously manned the Chatham site. They converted telegrams, telephone calls, weather, and news reports into Morse code radio messages and sent them to shipboard customers. On the flip side, they converted received messages into telegrams to be sent to private, commercial and government customers. Of course, they also relayed messages to ships at sea as well as monitoring for distress calls.

By the 1930s, WCC had a full time staff of over thirty people and was handling close to a quarter of a million messages a year! WCC was famous worldwide among maritimers, hams, and SWLers with its strong, 24-hour signals heard, on occasions, over most of the earth.

WCC's Place in History

As hub of world communications, WCC was the main communications channel in a number of historic events. Here is a short list covering the period 1921 to World War II.

Use of First Vacuum Tube Maritime Transmitter
Admiral Byrd's First Expedition to the South Pole – Contacts via WCC
First Circumnavigation of Earth by air Graf Zeppelin – Contacts via WCC
Lindbergh's Solo Flight Across Atlantic – Contacts via WCC
Hindenburg AirShip Explosion – Last Radio Contact WCC
Amelia Earhart's Round World Flight Attempt – WCC in contact net

WWII and Beyond

In 1942, during World War II, Chatham was conscripted by the US government and once again converted to a government facility. It played a major role in listening for Nazi naval vessels in the Atlantic, both surface and submarines. In addition, it intercepted Nazi command communications throughout Europe and the Atlantic.

At this time WCC Chatham's population peaked at over two hundred personnel. The transmitter of this era was the state of the art Press Wireless PW-15 transmitter, which produced 15 kilowatts of RF output.

After WWII, business was booming and con-



Figure 8 - WCC radio operators gather in the operations building. Circa 1948

tinued to do so for the next twenty years. Figure 8, taken in 1948, shows the WCC radio operators in the Operations Building at Ryder's Cove.

In 1950 came a major addition to WCC communications modes: TOR, Telex Over Radio. This early form of digital communications uses a two-tone system. WCC became one of the first, if not *the* first, maritime station to provide directly decoded printed messages, called "RCagrams," to and from shipboard customers. With this automated capability, WCC's daily message count grew to the thousands.

WCC had become so famous, that when the cruise liner *Santa Maria* was hijacked in 1961, the hijackers sent a message that they would only communicate with Chatham.

My WCC Experiences

I started shortwave listening in the early 1950s with my Dad while he did his woodworking. The radio was an old Zenith tabletop whose dial had yellowed years before I was born. But it worked, and with just a wire we would listen to the world from our home near New York City. Occasionally, a very strong Morse code signal would break on top of our target station. It happened so often that I learned Morse code just so I could discover the identity of the mystery signal.

That operator sent so fast I just couldn't decode anything. Then I caught on to the "de" that was sent near the end of each transmission. I listened carefully and decoded a "W" "something" "something." More concentration resulted in decoding "WCC." With that, I had my first encounter with the famous Chatham station in the 1950s.

A few years later I got my ham ticket, but always listened to the world on shortwave using my Lafayette HE-30, Heathkit GR-91(?) and Hallicrafters SX101. I lusted for a National HRO radio...that is until I discovered girls. Then the radios went dark for a while.

Five years later, at graduate school in central New York State, I picked up SWling again and joined the shortwave club SPEEDEX. Two years later, using a KIM-1 personal processor kit (the forerunner of the PC) and machine code programming, I wrote a routine to decode Morse code from my FRG-7's speaker.

Can you guess the first station I decoded? Right. WCC. The operator's Morse code sending "fist" was perfect, enabling the very primitive KIM-1 to lock on and decode the signal. As I watched "de WCC" scrolled across the calculator-like seven-segment LED displays, I felt at home again.

WCC Meets the PC

Almost another decade passed. I found myself living in beautiful England and with some free time. Armed with an Apple II clone and a Sony IC-2001, I tried my hand at RTTY and SITOR decoding. Very strong stations, located in the idyllic Cotswolds region of England, transmitted press, news and other messages in RTTY and what I guessed was SITOR or FEQ.

During a holiday lull in the UK station's activity I tuned around and heard a strong signal that seemed to ID in RTTY but transmitted messages in mixed modes of CW, RTTY, and something else. Yes, when the RTTY was decoded on the Apple II's green monitor, I discovered I was once again monitoring my old friend WCC. But this time I was over 3000 miles away!

Technical Beach Erosion

Things were changing for WCC. Communications technology was changing. Not in the normal evolutionary manner, but by leaps and bounds in revolutionary spurts. By the end of the 1970s, a new mode, SITOR, was gaining in popularity. SITOR, Simplex Teletype Over Radio, allowed two maritime stations to digitally communicate with each other via WCC. In many cases the operation was automatic, with no WCC operator intervention required. WCC started to become a big repeater site. Sure, it issued weather, news, and initiated some message traffic of its own. But the need for radio operators was on the decline, as was the use of Morse code as a mode of operation.

In addition, other competing communication channels were also developing. The soon to be major players – communications satellites and global cellular telephone networks – were up and running for military and some commercial customers, but were in their early consumer stages.

By the 1980s, civilization was on the brink of a true global community, with true satellite-based global communications. The handwriting was on the wall for shortwave.

The Circle is Complete

In 1986, General Electric, one of the original 1919 "parents" of RCA, bought RCA. General Electric's major interest was really only in RCA's entertainment business (NBC). GE immediately began dismantling the once powerful RCA company and selling off its pieces to the highest bidder.

At the time, I wondered if any other government would have allowed an advanced high tech company such as RCA, which was truly a national resource, to be cut up for profit. Talk about corporate raiders! A few years later I joined a company that had bought a part of RCA. It had turned into a disaster for all concerned, with mass layoffs and big losses.

MCI Communications, one of the newly formed telephone companies, bought the RCA division that included WCC. Five years later, in March of 1993, MCI converted WCC to an entirely remote-controlled station. Ryder's Cove became a very lonely place. All communications operations were performed remotely by KPH in California.

With a rapidly decreasing customer base, on June 30th 1997, WCC was silenced forever, with

this final message transmitted on 500, 4310.0, 6376.0, 12826.5, 16972.0 and 17117.6 kHz at 2340 UTC

BT CQ DE WCC IN 1901, CALLSIGN WCC WAS ASSIGNED TO THE SOUTH WELLFLEET MASSACHUSETTS WIRELESS TELEGRAPH FACILITY OPERATED BY GUGLIELMO MARCONI. MORSE CODE SIGNALS FROM WCC HAVE BEEN HEARD AROUND THE WORLD EVER SINCE. TODAY WE RETIRE WCC FROM WIRELESS TELEGRAPH OPERATIONS. WCC WILL CONTINUE TO SERVE THE MARITIME COMMUNITY IN ASSOCIATION WITH THE GLOBAL RADIO NETWORK OPERATED BY GLOBE WIRELESS. AR DE WCC SK

As for MCI Communications, today it no longer exists, having been bought and swept into what is now Verizon in 2006.

The Ryder's Cove Today

What does WCC look like in 2008? The location is still beautiful. It sits above a winding two-lane road running along the coast. At Ryder's Cove the road is mere feet from the water. The "Hotel" building used as residence for single radio operators is very prominent above the road as seen in Figure 9. Considering that many of the buildings were constructed in 1914, the site is in amazingly good condition. The Station Managers' houses are also in great shape.



Figure 9 - The WCC "Hotel" in 2008. Not bad for being ninety-four years old.

However, the Operations building is showing its age, as you may be able to see in Figure 10. Its looks now belie all the exciting messages that were received and transmitted from within the building. Now it has the appearance of a rundown, almost windowless, 1960s electronics factory. From information found on the web, ham radio station WA1WCC still operates from the Operations building.



Figure 10 - Operations building in 2008. Looks like an abandoned 1960's factory.

Peering through its scratched and unwashed windows, all I could see was empty space and a few piles of boxes and books. Then I saw it. I think it was a Hammarlund Super Pro, or maybe a National HRO receiver. With one look, my junior high school radio days came back to me.

I tried to picture the spot where I was now standing from the vantage point of forty, thirty, and twenty years ago when I was regularly listening to WCC. During those days, this place would have been a hive of activity. Now, in 2008, I had been the only one on the grounds of WCC for almost an hour and nobody seemed to care. What a difference time makes.

Towers, Poles & Nature

Carefully scanning the skyline revealed some interesting discoveries. At locations on the property I could see the top of three towers. Although the huge 400-foot tower was removed in 1954, clearly, antenna development at WCC continued. On a tower behind the Operations and Hotel buildings, a log periodic antenna was visible. These antennas were a favorite of the military, due to its ability to operate over a wide frequency range, while still providing directionality and gain.

On closer inspection, a large bird nest was now using the log periodic. See Figure 11. As I took the picture I thought, "Not many recent high power transmissions from this antenna."



Figure 11 - WCC tower with log periodic antenna and bird's nest! (Look carefully at the center of the boom.)

A number of towers and wire support poles are scattered around the site, many behind the buildings.

Finally, Figure 13 is looking toward the road and the Cove from the front of the Hotel. You can see a fifty-foot tower (I'm estimating) sitting close to the road and the water. This is the small tower seen at the left in the 1922 photo of the antenna array shown in Figure 7. Amazingly these still exist on the site in 2008. But, as a sign of the times for WCC and shortwave, another bird's nest sits at the very top of the tower. In fact one of its "residents" was sitting next to the tower on the many wire antennas that still crisscross the site.



Figure 12 - Looking toward Europe from the front of the "hotel."

See for Yourself

Talking about birds, you can get a bird's eye view of today's WCC site at Google Earth by going to 41°41'12.79 N and 69°58'48.41 W.

Today, ham radio station WA1WCC operates from the Operations building. The Chatham Marconi Maritime Center, CMMC, is a non-profit

organization whose goal is "...to enrich the lives of children and adults in Chatham and surrounding communities through the preservation and appropriate use of the historic Marconi site in Chatham."

If you are interested, I suggest you visit as soon as possible. The beautiful location of WCC is drawing interest from the community. Construction of a number of high priced homes has begun just to the north of the site. And the word in town is that the WCC site is being considered for a housing project.

Interestingly, I talk to a number of town residents and asked them about the "buildings out at Ryder's Cove." The answers were equally divided into three groups: "They had something to do with Marconi and radio," "They were part of the undersea cable" or "They didn't know what they were."

No matter what happens to the site, for those of us who remember monitoring WCC shortwave traffic in years gone by, WCC will fondly live in our memories. Memories of a different era, when shortwave was a major link in worldwide communications.

What Happened to Wellfleet?

The sea at South Wellfleet has long since fulfilled the engineering predictions and has reclaimed the site of Marconi's station and antenna towers. The Wellfleet site was abandoned in 1920. A plaque, seen in Figure 4, and the scale model of the site shown in Figure 2, commemorate the historic moment and location. I took the picture shown at the beginning of this article, looking from the buff where the plaque and scale model sit, toward the Atlantic. The original site lies about 50 feet offshore under water. But look carefully at the right and left side of the picture. You can still see two dark pieces of wood from Marconi's antenna masts.

If you're on the Cape you should not miss the opportunity to visit this beautiful site, now a part of the Cape Cod National Seashore at South Wellfleet. As I looked out over the sand dunes to the Atlantic with the sun setting, I tried to imagine the spot in 1903, one hundred and five years ago, as our civilization took its first baby step toward global communication.

MT

End Notes:

All photos of displays, historic pictures, and buildings were taken by the author in 2008.

For more information on WCC Chatham, look for the short, 2005 documentary "Chatham Radio WCC: The Untold Story," narrated by Walter Cronkite. Trailers for it can be viewed at www.revver.com/video/176379/walter-cronkite-narrates-guglielmo-marconi-documentary/.

Also Googling "WCC Chatham" will result in some very interesting websites.

If you would like to see a restored Press Wireless PW-15 transmitter (the type used at WCC in the 1940s), play the video at <http://coastradio.intco.biz/usa/kph.htm#top>

Our thanks to the http://www.gb4imd.org.uk/cape_cod_chatham.htm site for Figs 6 & 7. And to www.wjkane.com/wcchistory.html for Figure 8.

The Chatham Marconi Maritime Center, CMMC, is a non-profit organization. You can find details at www.chathammarconi.org/

Propagation Outlook October 2008 – March 2009

Myth-Busting

By Tomas Hood NW7US

“Where’s the Beef?” “Put up or shut up.” There are a growing number of radio hobbyists who have taken notice of the seemingly longer-than-usual solar cycle minimum. Where are the sunspots? Where’s the activity of a new solar cycle? “We’re going to see another Maunder Minimum.” “We’re about to enter a mini-ice age!”

The Maunder Minimum occurred during the period starting in 1645 and ending in 1715, an incredible 70 years during which sunspots were rarely observed. To the observer, this period is void of any evidence of any eleven-year solar cycles. What’s more, this period coincided with the infamous ‘Little Ice-Age’, a series of extraordinarily cold winters occurring in the Northern Hemisphere.

Speculation is increasing in lay and academic circles that we are experiencing an unusually long solar cycle minimum. The talk is spreading that perhaps we are entering another Maunder Minimum.

For example, a fair amount of chatter developed during August 2008, because it was the first time since 1913 that there was a month or more between sunspot appearances. Certainly, it stood out as unique, because it was the first time that a whole calendar month went by without observed sun spots. In a practical sense, however, this is not that remarkable; calendars mark arbitrary beginnings and endings, and a thirty-day period occurring at any time is just that – thirty days without sunspots. And such periods are not uncommon during the solar cycle minimums of the past.

On September 11, a sunspot developed that ended a period of 52 continuous days with no spots. This is the fourth longest spot-free period on record. Both May and June 1913 were spotless, in a continuous spotless run of 92 days from April 8 to July 8. Cycle 19 was the biggest solar cycle on record, and it is interesting to note that it was preceded by long periods without spots. There was a 26 day spotless run from February 15 to March 4, 1953, followed by 27 days from January 12 through February 7, 1954, and 30 days beginning on June 3, 1954 and running through July 2.

David Hathaway, NASA solar physicist, has reported that the quiet of 2008 is not the second coming of the Maunder Minimum. “We have already observed a few sunspots from the next solar cycle,” he says. “This suggests the solar cycle is progressing normally.”

During a solar cycle maximum, typically

lasting several years, huge sunspots and intense solar flares are a daily occurrence. This in turn triggers spectacular auroras that at times are observable in Florida and New Zealand. News reports tell of radiation storms knocking out satellites. Shortwave listeners and amateur radio operators are frustrated by frequent radio blackouts. The last such episode took place in the years around 2000-2001.

During solar cycle minimums, quite the opposite occurs. Solar flares are almost nonexistent while whole weeks or even months go by without a single, tiny sunspot anywhere on the sun. This is what we are experiencing now.

The question that’s on so many minds lately is regarding the length of the current solar minimum. Many are speculating that it is longer than usual, and perhaps something very significant is occurring.

“It does seem like it’s taking a long time,” allows Hathaway, “but I think we’re just forgetting how long a solar minimum can last.” The Maunder Minimum in the early 20th century is a case in point, where there were periods of quiet lasting almost twice as long as the current spell.

Hathaway has studied international sunspot counts stretching all the way back to 1749 and he offers these statistics: “The average period of a solar cycle is 131 months with a standard deviation of 14 months. Decaying solar cycle 23 (the one we are experiencing now) has so far lasted 142 months – well within the first standard deviation and thus not at all abnormal. The last available 13-month smoothed sunspot number was 5.70. This is bigger than 12 of the last 23 solar minimum values.”

In summary, “the current minimum is not abnormally low or long.” Additionally, the sunspots that are now occurring, though infrequently, are ‘cycle 24 sunspots’. Recent sunspots belong to either the dying cycle 23, or to the new cycle 24.

How do we know which cycle a sunspot belongs to? Sunspots are classified based on the magnetic polarities occurring in the complex structures within the sunspot group. When one cycle merges into the next, the magnetic polarities reverse. The latest sunspots are more often occurring with the magnetic polarities consistent with the new solar cycle 24.

More myth-busting

A common myth continues to be perpetrated around the radio communities: high-frequency

(shortwave) radio communications are pretty much ‘dead’ during the solar cycle minimum.

Those who spend reasonable periods of time ‘on the air’ – either monitoring, or engaged in two-way HF communications – find that there is plenty of action on the HF bands. Shortwave communications continue to work world-wide, offering exciting opportunities for radio hobbyists to establish DX contacts as well as regional contacts on a regular basis.

During September, for example, I watched the daily activity on 14.070 MHz in the 20-meter amateur radio sub-band where PSK-31 is used for two-way communications. Almost daily, I was able to decode European stations such as Belgium, Spain, Portugal, and Russia, as well as stations from Japan and South Korea, and also from South American stations (see figure 1 for an example PSK31 signal captured in Montana during September 2008). Most of these stations were running under 100 watts, if even 30 watts. I had two-way PSK-31 communications with Portugal and other stations in the same region. The 10.7-cm flux readings were under 70, and there were no sunspots. And, on the 40-meter PSK-31 sub-band, I also worked DX. Who said that HF was dead?

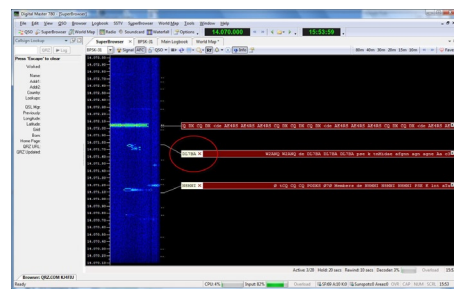


Figure 1: DX is alive and well even during the solar minimum. Here is a screen capture of a station in Germany (DL7 prefix) on PSK31 as decoded by Digital Master 780 (part of the Ham Radio Deluxe program suite). Source: NW7US, Tomas Hood

One observation made by active radio hobbyists is that day-to-day conditions are more consistent and without extremes as compared to the conditions occurring during a solar cycle maximum. During those months at the peak of a solar cycle, conditions vary from one extreme to another, with radio blackouts, rapid changes between sunspots, and geomagnetic storminess being a daily mix of challenges. During these months of minimal solar activity, conditions tend to remain consistently moderate, unless a

geomagnetic disturbance causes the ionosphere to weaken more than typical.

Geomagnetic storms and poor HF

A common space weather phenomenon that is always occurring is solar wind and the associated passage of solar plasma clouds. As the Sun rotates (the Sun will make one full rotation every 27 days), plasma spews out from the Sun, creating a solar wind. The plasma 'sheets' of the solar wind forms into a spiral shape known as the "Parker Spiral" (named after the scientist who first described it – see figure 2).



Figure 2: The solar wind 'Parker Spiral', where the Sun (center of the spiral) spews out solar plasma 'sheets' that form into this wavy spiral (see text). Source: NASA

This solar wind carries with it an interplanetary magnetic field, which ever expands away from the sun in this spiral. Think of one of those rotating lawn sprinklers with jets of water shooting away from the center. You can see a bending or curving of the water lines. As the Earth moves around the Sun, these spiraling solar winds sweep into Earth's magnetosphere. How the magnetic field lines (IMF) in the solar wind interact with the magnetic field lines of the magnetosphere is the key to geomagnetic storms and aurora (Northern and Southern Lights).

As the solar wind buffets the Earth's magnetosphere, it compresses the magnetosphere on the Sun-ward side, and 'drags' the magnetosphere far into the 'shadow' behind the Earth (figure 3). The magnetosphere also contains the Earth's magnetic field lines, running north-south from Earth's two magnetic poles. When the solar wind's magnetic lines (named 'Interplanetary Magnetic Field' or IMF) are oriented to the south (in relationship to Earth), they "connect" with Earth's magnetic lines. Think of how two magnets, when placed next to each, other will snap together with the south pole of one magnet connected to the north pole of the other magnet.

We measure the orientation of the solar

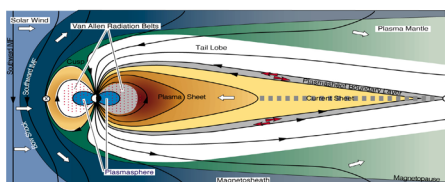


Figure 3: A diagram illustrating the Earth's magnetosphere and the play between the solar wind and the giant magnetic structure around the Earth (see text). Source: NASA

wind's magnetic structure and report it as the ' B_z ' index. A negative B_z indicates that the solar wind magnetic structure is oriented southward. This connection with Earth's magnetic field opens a window through which plasma riding the solar wind enters down into our atmosphere riding the magnetic field lines toward each of Earth's magnetic poles. This plasma in turn triggers aurora, and disturbs the geomagnetic fields resulting in the degradation of propagation.

The amount of solar plasma riding the solar wind is related to the source of the plasma. Plasma is ejected from the sun by various solar phenomena, such as a coronal hole, a prominence, or a flare. For instance, a coronal hole is a feature of the Sun's corona (one of the solar atmospheric layers), where plasma is 'leaked' out by weak magnetic structures in the coronal hole. Since the Sun makes one full revolution during one 27-day period, activity such as the coronal hole will re-appear every 27 days.

Earth's magnetic dipole axis is most closely aligned with the Parker Spiral in April and October. As a result, southward (and northward) excursions of B_z are then the greatest. This is why aurora is most likely to occur during these seasons, and why auroral events are strongest during the equinoctial months. And that is also why there are periods of moderate to strong degradation of ionospheric propagation conditions. Such disturbances may recur every 27 days, tied to the sun's rotation. During the solar cycle minimum, these disturbances cause very noticeable degradation of HF propagation, and they are even more pronounced if they occur during the equinoctial months (April and October).

Autumn and Winter and Cycle 24

The start of the Autumn DX season with the annual 'sweet' HF propagation begins right after the September Autumnal Equinox. This year's season is gearing up to be moderately active, even without sunspots. Figure 4 illustrates a 20-meter PSK31 signal originating at the author's location in Montana. This area coverage map was created by ACE-HF Pro, version 2.05 (<http://hfradio.org/ace-hf>), with the smoothed sunspot of 7 (solar flux 69) and a power output of 30 watts into a dipole. You can see that the 20-meter band is still useful for long distance communication during the solar cycle minimum. Figure 5 illustrates a real surprise: Seventeen meters is very useful for DX, despite the lack of solar sunspot activity.

It may be that we've seen two "valleys" in the solar minimum. It's been observed that past solar cycles such the one just past (Cycle 23) peak twice. It is also becoming clear that the solar cycle minima may also experience two minimums. In the current transition from Solar Cycle 23 to 24, we see one minimum for October 2007 with a smoothed sunspot count of 3.0. The second is for July 2008, with the smoothed count of 1.8. This double minimum has been observed during other solar minimum periods in the past.

Interestingly, such a double dipping may lend support of the earlier prediction that Cycle 24 will be an intense cycle. This forecast may be

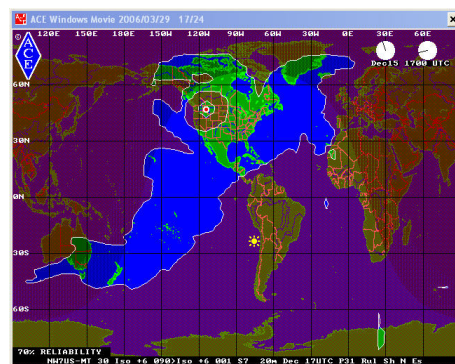


Figure 4: PSK31 on 20 meters in October with a smoothed sunspot count of 7. This area coverage map is of a 30-watt PSK31 transmission originating at the NW7US station in Montana. Notice the coverage possible during the sunspot cycle minimum. Source: NW7US, using ACE-HF Pro (<http://hfradio.org/ace-hf>)

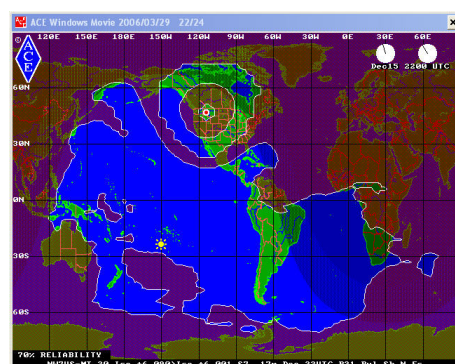


Figure 5: PSK31 on 17 meters in October with a smoothed sunspot count of 7. Despite the sunspot cycle minimum, seventeen meters is very useful for DXing. Source: NW7US using ACE-HF Pro

found in the ARRL bulletin, ARLP010 from 2006 at www.arrl.org/w1aw/prop/2006-arlp010.html. Since that forecast, several forecasts have moved away from the intense cycle activity to a possibility that this new cycle will be moderate to weak. A new forecast is pending, as scientists are waiting for the sun to begin demonstrating renewed and growing activity.

General Winter Conditions

As is typical of the autumn and winter HF season, low-frequency activity vastly improves over summer conditions due to the decrease in lightning storms, and the longer daily periods of darkness. Even during the solar cycle minimum, these bands (below 20 meters) are alive and well.

But what can you do on the higher frequencies this season? The higher shortwave frequencies are alive, too. During the winter months the maximum usable frequencies (MUF) are generally higher during the daylight hours than during the summer daylight hours due to the shorter distance between the Earth and Sun during this season.

This provides short but strong openings on higher shortwave bands during the winter day. Then, at night, the MUF dips down much lower than what would be seen during the summer nights. Summertime MUFs are generally higher

during the night hours than during the winter nights, in part because the ionosphere stays energized through the short nights. Winter nights are longer, so recombination of the ionosphere (which results in a lowering of the MUF) is more complete.

This also means that the D layer of the ionosphere is less ionized during the winter, allowing medium wave and shortwave frequencies to propagate through the D layer and off of the E and F layers. Finally, the seasonal decrease in weather-related noise makes it easier to hear the weaker DX signals on lower frequencies. With thunderstorms few and far between, storm-related static and noise is greatly reduced.

Seasonally, the geomagnetic activity tends to quiet down during the winter months. The most active geomagnetic seasons are centered on the two equinoxes, in the spring and autumn. Combined with the seasonal decrease in geomagnetic activity, the lull in the eleven-year solar cycle geomagnetic activity translates to generally quiet conditions on lower HF and on the MF spectrum.

December is well enough past the autumnal equinox and the associated peak auroral activity to support transpolar propagation. With this overall reduction of geomagnetic activity and the decrease of radio signal absorption, comes more stable high-latitude propagation. Medium wave DXers enjoy catching broadcast station transmissions from over the North Pole. Short-wave DXing over high-latitude paths becomes exciting, even if the higher frequency bands might be dead.

During October, signals below 75 meters are still hard to hear under the seasonal static. The static then steadily decreases as we move into the longer hours of darkness during the winter months. With the seasonal reduction in thunderstorms and atmospheric static noise in the Northern Hemisphere, it becomes easier to hear the weaker signal DX.

As we get closer to January, expect DX openings during the hours of darkness and into the sunrise period. Look for openings from Europe and the south if you are listening in the eastern half of the United States, and from the south, the Far East, Australasia, and the South Pacific if you are in the western half of the country.

Winter Conditions by Band

Expect long-range DX on the low bands, starting close in right after sunset, and extending farther as the night develops. Signals here should peak from Europe and from a generally easterly direction around midnight. DX paths will move farther west through the night. By morning, openings from Asia should be common. For openings in a generally western direction, expect a peak just after sunrise. The band should remain open from the south throughout of the night. Propagation in this band is quite similar to that expected on 41 meters, except that signals will be somewhat weaker on the average, noise levels will be a bit higher, and the period for band openings in a particular direction will be a bit shorter.

Forty-one meters should be the hottest DX band during the dark hours, as the seasonal static levels are lower than they were during the sum-

mer. The band should be open first for European DX in the eastern United States during the late afternoon. Signals should increase in intensity as darkness approaches. During the hours of darkness, expect good DX openings from most areas of the world. Signals should peak from an easterly direction about midnight, and from a westerly direction just after sunrise. Excellent openings toward the south should be possible throughout most of the nighttime period.

The all-season bands, 31 and 25 meters, are crowded and signals are usually very strong and steady. These bands will often remain open into many areas late into the night and will open early in the morning, especially when part of the propagation path moves through sunlit regions. Twenty five meters is expected to be an excellent band for medium distance (500 to 1500 miles) reception during the daylight hours. Longer distance reception (up to 2000 to 3000 miles) should be possible for an hour or two after local sunrise, and again during the late afternoon and early evening. Heavy congestion will occur here since many international and domestic broadcasters make use of 25 meters.

Thirty-one meters, the backbone of worldwide shortwave broadcasting, will provide medium-distance daytime reception ranging between 400 and 1200 miles. During November, reception up to 2500 miles is possible during the hours of darkness, and until two to three hours after local sunrise. Thirty-one meters, too, is highly congested, making reception of weak exotic signals a bit more of a challenge.

Twenty-two through 19 meters compete with 16 for the best daytime DX band during October. They will open for DX just before sunrise and should remain open from all directions throughout the day, with a peak in the afternoon. Nighttime conditions will favor openings from the south and tropical areas. Since the Southern Hemisphere has long daylight hours, DX paths on these bands from stations in the south will be common.

Nineteen through 25 meters compete with 16 for the good daytime DX during November and December. They will open for DX just before sunrise and should remain open from all directions throughout the day, with a peak in the afternoon. Nighttime conditions will favor openings from the south and tropical areas. Since the Southern Hemisphere has long daylight hours, DX paths on these bands from stations in the south will be common.

Sixteen through 13 meters will be open occasionally. Paths from Europe and the South Pacific as well as from Asia are possible, especially on 16 meters. Look for best conditions from Europe and the northeast before noon and from the rest of the world during the afternoon hours. Reception from the South Pacific, Australia, New Zealand, and the Far East should be possible well into the early evening. When flux levels remain lower, these openings may be short-lived.

The best propagation aid is a set of sunrise and sunset curves, since DX signals tend to peak when it is local sunrise at the easterly end of the path in question. A good Internet web site featuring a gray line map display is found at www.fourmilab.to/earthview/. Follow the link, "map of the Earth" showing the day and night regions.

Short Skip

For short-skip openings during December, try 90 through 41 meters during the day for paths less than 250 miles, and 90 down to 120 meters at night for these distances. For openings between 250 and 750 miles, try 41 meters during the day, and both 90 and 120 at night. For distances between 750 and 1300 miles, 22 through 31 should provide daytime openings, while 41 down to 90 will be open for these distances from sunset to midnight. After midnight, 90 meters will remain open out to 1300 miles until sunrise. Try 31 and 41 meters again for about an hour or so after sunrise.

For openings between 1300 and 2300 miles, openings will occur on 22 through 16 meters, with fewer on higher bands, during the daylight hours. During sundown to midnight, check 22 through 41 meters for these long-distance openings, and then check 41 down to 90 meters after midnight until sunrise. Try 41 and 31 meters again for an hour or so after sunrise.

Late Winter Conditions

Propagation changes again after January, as the hours of daylight increase. March is one of the optimal DX months. As the Spring Equinox approaches, the gray line terminator begins to run straight North and South. The return of sunlight to the polar north creates north-south openings on 11 through 25 meters.

By March, 16 meters will still stay open long into the evenings. You will occasionally find 16 meters open all night long. Daytime paths will not degrade much until midsummer. You will see more early closures if you live closer to the North Pole.

Twenty-two and 19 meters will remain in excellent shape. Both short and long path circuits are reliable and solid. All nighttime paths are wide open during March. Prime time evening hours in the United States are sunrise hours across Russia, Africa, and both the Near and Far East. Expect a lot of short and long path DX from these areas of the world.

Between sunset and midnight, expect occasional DX openings on all bands between 15 and 41 meters. Conditions should favor openings from the east and south. These bands should peak for openings from Europe and Africa near midnight.

From midnight to sunrise, expect optimum DX conditions on 31 through 90 meters, and occasionally, 120 meters. Conditions should favor openings from the west and south. Some rather good openings on 19 and 22 meters should also be possible from the south and west during this time.

Noise levels are slowly increasing as we move toward the spring season. Geomagnetic storms will increase, disrupting the mid- and high-latitude ionosphere. During the Spring Equinox, Earth's magnetic field is sufficiently perturbed by solar wind particles flowing into the auroral zone (between 50 and 70 degrees north geographic latitude) to cause the ionosphere to be depleted.

continued on page 67

Q. *My company is planning to purchase the new WinRADIO WD-3300 radio direction finding (RDF) system. What range of distance can I plan on it being effective? (JSK, email)*

A. VHF/UHF reception range is dependent upon a number of factors which include transmitter power, transmitting and receiving antenna gain, antenna height, relative ground elevation of your position compared to the target position, transmission line loss, frequency, distance to the visual horizon, intervening structures like buildings, the presence of reflections (multipath), forests and mountains, and even weather conditions like rain and tropospheric ducting.

VHF and UHF signals propagate much like light, but because they are much lower in frequency (longer in wavelength), they are refracted slightly downward by the atmosphere, extending their range beyond the visual horizon.

An approximate calculation to the visual horizon is: Distance in miles = $\sqrt{2 \times A_f}$ where A_f is the height of the antenna in feet (If the target transmitter is also using a high antenna, you would add that height to the "A" factor).

From my location on a mountain top, I can hear fixed base stations at higher power more than 75 miles distant. I would suspect that on flat terrain, you should be able to hear such strong signals at a distance of 50-75 miles—further at the lower frequencies, and less far at upper UHF.

Q. *Has anyone ever done a sweep of the Grove Scanner Beam? If not, your claims of specific frequency coverage are questionable to me because this is just a TV antenna turned vertical. Current TV frequencies fall well outside public safety bands; channel 7 begins at 175 MHz, completely missing 150-174 MHz. (Bob AF6D)*

A. Many sweeps were done at the factory during the development of the Scanner Beam which is now in its third iteration. But saying that it's "just a TV antenna turned vertical" is like saying that a telescope is just glass in a tube. The elements are cut for resonance, reflection and direction to favor the land mobile bands, not TV.

From 50-950 MHz, the VSWR fluctu-

ates between 1.4:1 - 3.5:1; above 950 MHz the VSWR rises slowly to 5:1, but on the amateur 1260 MHz band, it's back down to 2:1. Used with low-loss cable, this is very respectable VSWR for receive purposes, and even low power transmitting.

So far as directivity, it's essentially non-directional below 100 MHz, then exhibits the desirable cardioid pattern from roughly 100-450 MHz. Above that, the directivity is multi-lobed, making it roughly non-directional.

Having sold thousands of Scanner Beams, I can assure you it's a very satisfactory VHF/UHF antenna.

Q. *What frequency does WiFi transmit at? Do their harmonics create interference to other bands? (Doug, UT)*

A. WiFi Internet radios share the FCC Part 802.11 wireless computer service between 2.40-2.48 GHz. Their low power, RF filtering, and rapid frequency hopping avoid causing interference to harmonic frequency ranges as well as to other signals in their own range.

Q. *For digital TV reception, which TV converter boxes would you recommend for use with wideband receivers like the AOR AR5000+3 and the accessory AOR TVA-1, or the ICOM IC R-7000 and its accessory TVR-7000? (Hank Lane, KB1JLA, Carlisle, MA)*

A. Judging from the preliminary reviews, all of the DTV converter boxes have about the same sensitivity, which would be the most important specification. I'd say you should simply look for the features and price you want and buy it.

The converter is installed just like any frequency converter – between the antenna and the receiver. It is controlled by a hand-held remote.

As you probably have heard, the government is giving out up to two \$40 gift cards to each family toward the purchase, so most acquisitions are close to free! But the gift cards are limited, so you'd better get them while they are available, and certainly before February 17 when all VHF/UHF analog TV ceases. Keep in mind, however, that only VHF/UHF-TV stations are affected, so if you have cable or satellite service, you won't

have to do a thing.

If you do have one of those two services, you can even hook your receiver wideband communications receiver to the cable or satellite output just as you would your analog TV set, and tune the receiver to the same center-channel frequency the output is set for.

Q. *I sometimes listen to TV audio on a little portable radio. I suppose that won't work after the switch to digital TV. What would one need to pick up the audio after February 2009? (Victor Commisso, Lebanon, PA)*

A. Since there are no hobby converters or receivers yet available for the reception of digital TV audio, you will need one of the digital-to-analog tuners presently being sold by Wal-Mart and other major suppliers for people who want to continue to watch TV on their old analog sets. They can also be hooked up to the antenna post of any radio or scanner that gets the present UHF-TV audio channels, since that's where the majority of digital TV signals are being assigned.

Q. *I have noticed that during electrical storms, the static crashes are much weaker on the shortwave bands than on the medium wave bands. Why is that? (Mark Burns, Terre Haute, IN)*

A. I can think of two good reasons:

(1) The lightning-produced, fundamental-frequency signals are stronger to begin with than the higher-frequency harmonics they produce, and

(2) The higher frequencies have a higher take-off angle (line of sight to the visual horizon, then straight on into space) than the lower frequencies which hug the earth better with their surface waves; therefore, the lower frequencies deliver more signal from a wider swath of the electrical storm to the receiver.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. Mail your questions along with a self-addressed stamped envelope in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.)

Digital TV and Music via Satellite DTV Channel Assignment Mysteries

MT reader Allen from Wilkes-Barre, Pennsylvania had some good questions about the seemingly random nature of channel assignments for his local TV stations in this new era of digital TV. For example, WYOU-TV, which had been channel 22 in the analog world, was re-assigned to channel 13; WOLF-TV channel 38 was re-assigned to channel 45.

It's hard to believe, but the television industry first began work on various formats for over-the-air (OTA) digital TV (DTV) transmissions 20 years ago. And, the FCC first began the transition from analog OTA television to DTV more than 10 years ago. By November 1998, as many as 43 stations in 24 markets were already on the air with DTV programming and the official cut-off date for the transition to total DTV was December 31, 2006.

As usual, it was all a bit more than the FCC or the TV industry was prepared for, so the eventual switch date was set for February 17, 2009. Part of the delay was in getting the creaky wheels of the FCC rolling and the rest was routine procrastination on the part of the OTA broadcast industry.

❖ What's the Frequency?

The first thing the Commission did was lop off the "700 MHz" band – which is actually from 698 to 806 MHz and takes in channels 52-69. That swath of frequencies had been ticketed for public safety (fire, police and first responders) in a move – long before 9/11 – to nationwide interoperability. Reassignment would force stations on those channels to move. It also took those channels entirely out of play, squeezing the 1,700 plus existing stations into a smaller spectrum, what the FCC calls the "core" broadcast spectrum, from channels 2-51.

It would have been nice to have removed channels 2-13 (VHF-TV) as well, so that consumers would need only smaller, cheaper, lighter-weight UHF-TV antennas for DTV reception. But, interference concerns from geographically close markets (particularly in the east) and interference concerns with markets along the northern and southern borders all had to be taken into consideration.

In 2005 the FCC developed what it called the "DTV channel election process," in which

all 1,700 stations filed their channel preferences for final DTV assignment in "Round One." Here's what happened, according to an FCC press release from June, 2005:

"1,628 stations elected either their existing NTSC (analog) or digital channel. Another 50 stations elected to forego a Round One election and participate in Round Two. In addition, 62 stations participated in 37 Negotiated Channel Arrangements (NCAs) that were filed with the FCC. In an NCA, stations within a market were permitted to enter into an agreement to elect a channel other than their own, so long as every station potentially affected was included in the agreement."

In November 2005 Round Two was held, and in August 2006 Round Three completed the process. The results were that very few stations had to migrate to or stay on VHF. Most top 10 markets got all UHF channels. Los Angeles, for instance has all 26 UHF-TV channel assignments with no VHF channels in its market. New York City got only one VHF channel for its 23 TV stations; Chicago got only one VHF channel as did Philadelphia; Boston, Washington, D.C., and Atlanta are all UHF, according to the National Association of Broadcasters.

The FCC is allowing stations to retain their call sign and original channel assignments, so as to minimize public confusion (if that was at all possible). Since built-in DTV tuners and converter boxes automatically search and label the stations, consumers don't need to know that old faithful channel 6 is actually transmitting on channel 47, for instance. They can still call themselves channel 6.

To find out what the actual channel assignments are in your area, check out the NAB site here: www.nab.org/AM/ASPCode/DTVStations/DTVStations.asp.

❖ Satellite Radio Options

Ken Hunt K1KWH wrote that he is moving from Portland, Oregon, to a small town of about 18,000 and was about to sign on with Sirius Satellite Radio, when my column from August about just that subject ("Tuning in to the Other Satellite Radio") changed his mind. Ken, who is 80 years old and has been a ham since 1958, said all he wants is music. He likes



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Skyvision offers a complete W5 C-band package for \$329.95. You get the Motorola DSR-410 receiver, a 6' black mesh dish and C-band LNBF. (Courtesy: Skyvision)

the big band sounds and the big band singers. He thought perhaps the Ku-band FTA system I talked about in the column might be the thing for him.

First, Ken my heartiest congratulations on 50 years in amateur radio; that's quite an accomplishment! Second, I think you should reconsider the FTA route to satellite radio. While FTA satellite has many attributes, Big Band music is not one of them, I'm sorry to say. But, there are still legitimate options to Xirium or whatever they'll eventually end up calling the combined XM/Sirius satellite radio service. One is old-fashioned C-band satellite. Yes, the big dish still has a little life in it for those willing to put in the money, time and effort.

Starting Something Old

If you look around your area you should be able to locate a big dish that's no longer in use. Some are free for the asking (MT's own Kevin Carey did that a few years ago). Many satellite retailers have stacks of these dishes, complete with feed horn and LNB behind their shops. They've taken them out of service when replacing the big dish with DISH Network or DirecTV. These big dishes have value and I wouldn't expect a dealer to just give them away. Still, people haven't been breaking down the doors to buy one, so a reasonable



If you already have a dish and LNBF, Skyvision also sells the Motorola 4DTV receiver that has a dish drive and tunes analog as well as DigiCipherII programming for \$479.95. (Courtesy: Skyvision)

offer may do the trick. The next step is to buy a Motorola 4DTV C/Ku-band receiver which is used to drive the dish and tune the satellites.

Once the 4DTV receiver is authorized (by calling an 800 number), you can subscribe to programming. But, if you don't want the programming, the receiver still works. And one of the things it can receive is the line-up of DMX music channels on W5 (aka G4 at 101°W), which not only has a Big Band music channel, but it also has a Great Standards channel with many of the old Big Band singers. The channels have no commercials, no DJs, no announcements of any kind. Information about the music you hear is displayed on your TV.

For best quality sound, route the audio from the 4DTV receiver into your stereo and you'll get full audio fidelity. It's pretty nice. As I'm writing this I'm listening to the channel and hearing Charlie Barnet and his orchestra with the song "Early Autumn." Other pieces playing while I'm writing: Artie Shaw, "The Man from Mars," Peggy Lee and Benny Goodman "We'll meet again." That should give you an idea of the depth of the coverage of this genre of music.

If you can't find a free dish or a used system in your area, your best bet is Skyvision, a long-time C-band mail-order retailer (and *MT* advertiser) who still has all the gear needed to get into C-band, including the Motorola 4DTV receiver. Their service is great, the products excellent and they have a qualified support staff that will help you every step of the way with your installation.

Skyvision also makes available a W5 system that consists of a 6-ft mesh dish with LNBF and a special Motorola 410 receiver. It has no dish drive and is only capable of receiving the programming on W5 and no other satellite. The combo (6-ft dish, LNBF and DSR410 receiver) is priced at \$329.95 from www.skyvision.com or call 800-500-9268. You'll still need a run of RG/6 coax to go from the dish to your receiver in the house, but that'll be the least of your expenses.

Still More Music Options

Let's look at the alternatives. DISH Network has Big Band music in its audio channel line-up. But, even if you get the equipment free, you'll be asked to sign up for at least a year to a package of programming you may have no interest in. The lowest priced package that features music is \$32/month. For a similar price, DirecTV gives you a choice of four XM channels. No help there.

DMX offers a 45 channel C-band line-up (www.dmx.com click on "residential") of its programming, which includes Big Band. It utilizes its own proprietary receiver and dish system. But, that system is good only for DMX audio, you can't receive anything else on it.

There's no telling what will happen, as this is written, with the XM/Sirius merger. Right now, neither Sirius nor XM offer a Big Band channel so that's no help. They'll tell you that Big Band music can be found in their Classic Jazz programming. Not good enough! DMX has a full time Big Band channel 24/7. Take a look at the music channel line-up below



Hard to find parts such as this home docking kit for an older XM SkyFi unit can be found at MyRadioStore.com. The home kit is just \$30 plus shipping. (Courtesy: MyRadioStore.com)

and if you can't find at least two channels you'd listen to, you don't like music!

By the way, if you come across an orphan and older XM SkyFi unit without the docking cradle, you can get a new docking station, antenna, power supply and audio cables for just \$30 plus shipping at MyRadioStore.com. This company sells many items for both satellite radio services that are hard to find. I've dealt with them and have been very happy with the prices and service. Check out their web site www.myradiostore.com or call 866-463-3396 for more information.

Of course, for \$329.95 or \$479.95, the cost of either C-band option, you could buy a lot of Big Band CDs and not have to fool with a dish or the bother of putting it in or maintaining it. But, what fun would that be?

DMX MUSIC CHANNELS ON W5 C-BAND

- 820 Beautiful Instrumentals
- 821 Jazz Vocal Blends
- 822 Hottest Hits
- 823 Modern Country
- 824 Alternative Rock
- 825 Adult Contemporary
- 826 Lite Classical
- 827 60s Oldies
- 828 Classic Rock
- 829 Urban Beat
- 830 Urban Adult Contemporary
- 831 Rap
- 832 Classical Jazz
- 833 Rock'n'Blues
- 834 Gospel
- 836 Coffeehouse Rock
- 837 Dance
- 838 Contemporary Christian
- 839 Album Rock
- 840 Hard Rock
- 841 80s Hits
- 842 70s Oldies
- 843 Classic R & B
- 844 Traditional Country
- 845 Soft Hits
- 846 Retro Dance
- 847 Groove Lounge
- 848 Big Band/Swing
- 849 Smooth Jazz
- 850 New Age
- 851 Holiday Happenings
- 852 Great Standards
- 853 50s Golden Oldies
- 854 Reggae
- 855 DMX-Trends
- 856 Symphonic

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In the early days of Internet streaming, radio stations would broadcast their NFL game streams online, providing some relief. That is, until the NFL introduced the subscription-based NFL Fieldpass. For \$9.95 per month, fans could follow each game of their favorite team, no matter what city they were in.

However, true fans know that the game isn't where the fun ends. There are pre-game shows, post-game shows, coaches' shows, call-in shows. This is where diehard fans can get their total fill of their team. So, for NFL fans, no matter your team, here is a primer to get you started on where and when to click to hear the very latest on your favorite team.

Remember, these stations are not allowed to stream their actual game broadcasts, but all other team-related broadcasts are allowed. For those who want information on the NFL Fieldpass service, go to nfl.com/fieldpass (requires Windows Media Player 10 or later or Real Player 10.5 or later). (All times are local)

ARIZONA CARDINALS

Flagship station: KTAR 620 AM/92.3 FM Announcers: Dave Pasch (PBP), Ron Wolfley, Paul Calvisi (SR). Pre-game: *Kia NFL Kickoff Show* with Bill Lewis (1hr), *Arizona Cardinals Pre-Game Huddle* with Calvisi, Rob Moore and Rob Frederickson. Post-game: *Cardinal Talk* with Bill Lewis. Other programs: *Big Red Rage* with Bertrand Berry each Thursday at 6pm.

ATLANTA FALCONS

Flagship station: WZGC 92.9 Dave FM Announcers: Wes Durham (PBP), Dave Archer. Pre-game: Begins two hours before kickoff with Jeff Van Note. Post-game: Begins at the conclusion of the game with Jeff Van Note. Other programs: *Monday Night Coaches Show* from 7 to 8 p.m.

BALTIMORE RAVENS

Flagship station(s): WBAL 1090 AM/WIYY 97.9 (98 Rock) Announcers: Gerry Sandusky (PBP), Rob Burnett and Stan White. Pre-game: *Ravens Gameday* with Steve Davis begins three hours before kickoff. Post-game: *Ravens Gameday* with Steve Davis begins at the conclusion of the game. Other programs: Mondays at 6 p.m.:

The Derrick Mason Show (Monday Night Live), Tuesdays at 6 p.m.; *The Coach John Harbaugh Show*; Wednesdays at 8 p.m.; *Ravens Report* with Quadry Ismail; Thursdays at 8 p.m. *Gameplan*; Fridays at 6 p.m. *Purple Passion* with Keith Mills.

BUFFALO BILLS

Flagship station: WGRF 96.9 FM (97 Rock) Announcers: John Murphy (PBP), Mark Kelso, Rich Gaenzler. Post-game: Interviews and segments are available for download from buffalobillsradio.com

CAROLINA PANTHERS

Flagship station: WBT 1110 AM Announcers: Mick Maxon (PBP), Eugene Robinson, Jim Szozke. Pre-game: Begins three hours before kickoff with the *Panthers Stadium Show* with Szozke. *Countdown to Kickoff* begins one hour before kickoff. Post-game: *Panthers Post-Game* with Szozke followed by *Panthers Wrap-up* (only on WBT) for one hour. Other programs: *Panther Talk* every Monday (or Tuesday) from 8:05 to 9 p.m. with Head Coach John Fox; *Panthers Updates* are aired twice daily on all network stations Monday through Friday, once in the morning and once in the afternoon.

CHICAGO BEARS

Flagship station: WBBM 780 AM Announcers: Jeff Joniak (PBP), Tom Thayer, Dan Hampton. Podcasts: Available through WBBM as well as other Bears' info. Other programs: *Bears' Insider* begins at 7 p.m. Each Monday night with Joniak and Head Coach Lovie Smith.

CINCINNATI BENGALS

Flagship stations: WCKY 1530 AM (1530 Homer The Sports Animal), and WEBN 102.7 FM. WLW 700 AM begins simulcasting games after the conclusion of baseball season Announcers: Brad Johansen (PBP), and Dave Lapham. Pre-game: *Countdown to Kickoff* with Alan Cutler. Post-game: *Bengals Feedback* with Ken Broo.

CLEVELAND BROWNS

Flagship stations: WMMS 100.7 FM / WTAM 1100 AM Announcers: Jim Donovan (PBP), Doug Dieken and Andre Knott (SR). Pre-game: *Countdown to Kickoff* with Kevin Keane and Bob Franz begins three hours before kickoff. Post-game: *The Locker Room Report* with Mike Snyder and Andre Knott followed by *The End Zone* with Snyder. Other programs: Also pre-game coverage can be heard on WTAM 1100 AM beginning at 8 a.m. Each Monday (or Tuesday) on WTAM at 7 p.m. *The Hank Fraly Show* with Snyder and Fraly.

DALLAS COWBOYS

Flagship stations: KTCK 1310 AM (1310 The Ticket) / KDBN 93.3 FM (The Bone) / KTKR 760 AM, San Antonio (The Ticket) Announcers: Brad Sham (PBP), Babe Laufenberg, Kristi Scales (SR). Pre-game: *Cowboys Countdown to Kickoff* with Bob Strum, begins three hours before kickoff.

Post-game: *Cowboys Overtime* with Norm Hitzges. Other programs: On KTCK 1310 AM during the week: *The Jerry Jones Show*, Tuesdays at 7:50 a.m.; *The Wade Phillips Show*, Wednesdays at 7:50 a.m.; *The Jason Witten Show*, Wednesdays at 12:10 p.m.; *The Troy Aikman Show*, Thursdays at 7:50 a.m.; *The Jerry Jones Show*, Fridays at 10:10 a.m. *The Cowboys Hour*, Mondays at 7 p.m.; *Turf Talk*, Tuesdays at 7 p.m.; and the *Cowboys Legends Show*, Wednesdays at 9 p.m. On KTKR 760 AM during the week: *The Ranch Report* every Monday, Tuesday, Thursday and Friday at 5:30 p.m.; *The Terrance Newman Show*, Wednesdays at 5:30 p.m.; and *Talkin' Cowboys*, weekdays from 2 to 3 p.m. On WOAI 1200 AM, San Antonio: *Talkin' Cowboys* with Jerry Jones, Tuesdays at 8:40 a.m.; *Wednesdays with Wade* with Head Coach Wade Phillips, Wednesdays at 8:40 a.m.; and the *Daily Report* with Brad Sham, weekdays at 5:55 a.m.

DENVER BRONCOS

Flagship station: KOA 850 AM Announcers: Dave Logan (PBP), David Diaz-Infante, Alan Roach (SR). Other programs: Mondays at 8:05, an update with Dave Logan, voice of the Broncos; *The Broncos' Tony Scheffler* at 5:10 p.m. each Tuesday; *Broncos Talk*, Thursdays at 7 p.m.; *The Coaches' Show* with Head Coach Mike Shanahan, Friday at 7:45 p.m.; and *Broncos' quarterback Jay Cutler*, Fridays at 5:10 p.m. Additionally, podcasts are available at the Web site listed in the box below.

DETROIT LIONS

Flagship station: WXYT 1270 AM / 97.1 FM Announcers: Dan Miller (PBP), Jim Brandstatter, Tony Ortiz (SR). Pre-game: Begins three hours before kickoff.

GREEN BAY PACKERS

Flagship station: WTMJ 620 AM Announcers: Wayne Larivee (PBP) and Larry McCarren. Pre-game: *Packers GameDay* begins two hours before kickoff with Denise Krause, Lance Allman and Bill Scott. *Packers' Preview* begins 50 minutes before the kickoff. Post-game: *Packers Overtime* with Bill Michaels.

HOUSTON TEXANS

Flagship station: KILT 610 AM (Sportsradio 610) / 100.3 FM Announcers: Mark Vandermeer (PBP), Andre Ware, Rich Lord (SR). Pre-game: *Capital One Countdown to Kickoff* with Matt Jackson and Adam Wexler begins three hours before kickoff. Post-game: *Sportsradio 610 Fan Feedback*. Other programs: *Gary Kubiak Show* each Monday at 5 p.m.; *SR610 Verizon Wireless Texans Bull Pen Show*, Tuesdays from 6 a.m. to 10 p.m.; *SR610 Texans Player Show*, Tuesdays at 5 p.m.; *Texans Fitness Show*, Saturdays from 7 to 8 a.m.

INDIANAPOLIS COLTS

Flagship stations: WFNI 1070 AM (The Fan) / WLHK 97.1 (Hank FM) Announcers: Bob Lamey (PBP), Will Wolford. Other programs: Mondays from 6 to 7 p.m. with *The Bill Polian Show* on

FLAGSHIP STATION WEB SITES

Arizona Cardinals – www.ktar.com/sports
 Atlanta Falcons – <http://atlantafalconsradio.com>, www.929dave.fm
 Baltimore Ravens – <http://wbal.com/sports/ravens/>
 Buffalo Bills – <http://97rock.com>, <http://buffalobillsradio.com/>
 Carolina Panthers – <http://panthers.wbt.com/>
 Chicago Bears – www.wbbm780.com
 Cincinnati Bengals – <http://wcky.com>, <http://700wlw.com>, <http://webn.com>
 Cleveland Browns – <http://wmms.com>, <http://wtam.com>
 Dallas Cowboys – <http://radio.woai.com>, <http://theticket.com>, <http://ticket760.com>, <http://933thebone.com>
 Denver Broncos – <http://broncosradionetwork.com>
 Detroit Lions – www.971theticket.com
 Green Bay Packers – www.620wtmj.com
 Houston Texans – www.sportsradio610.com
 Indianapolis Colts – www.1070thefan.com, <http://971hankfm.com/colts>
 Jacksonville Jaguars – <http://wokv.com/sports/jaguars.html>
 Kansas City Chiefs – <http://kcchiefsradio.com>, <http://kcfx.com>
 Miami Dolphins – <http://wqam.com>
 Minnesota Vikings – <http://kfan.com>
 New England Patriots – <http://patriotsradio-network.com>
 New Orleans Saints – <http://wwl.com>
 New York Giants – www.wfan.com
 New York Jets – sports.espn.go.com/stations/1050espradio/jets
 Oakland Raiders – <http://ksfo560.com>
 Philadelphia Eagles – <http://eaglesradionetwork.com>
 Pittsburgh Steelers – <http://dve.com>, <http://fox970.com>
 San Diego Chargers – <http://570klac.com>, <http://rock1053.com>
 San Francisco 49ers – www.knbr.com, www.1077thebone.com
 Seattle Seahawks – www.mynorthwest.com
 St. Louis Rams – <http://ramsradionetwork.com>
 Tampa Bay Buccaneers – <http://us1035.com>
 Tennessee Titans – <http://103wkdf.com>, <http://titansradio.com>
 Washington Redskins – www.espn980.com
 NFL Fieldpass – www.nfl.com/fieldpass

Hank FM; Colts Update weekdays at 4:15 p.m. on The Fan. Practice Update each Monday through Thursday at 6:45 p.m. on The Fan. Colts Friday Night from 6 to 7 p.m. on The Fan. Colts podcasts are also available through iTunes.

JACKSONVILLE JAGUARS

Flagship station: WOKV 690 AM / 106.5 FM Announcers: Brian Sexton (PBP), Jeff Lageman. Other programs: Jags Reporters, Mondays at 6 p.m.; Coach Jack Del Rio Show, Tuesdays at 6 p.m.; Jags This Week, Wednesdays at 6 p.m. Additionally, on the Web site, podcasts, blogs, news and more are available.

KANSAS CITY CHIEFS

Flagship station: KCFX 101.1 FM (The Fox) Announcers: Mitch Holthus (PBP), Len Dawson, Kendall Gammons. Other programs: Chief Kingdom Show, Monday evenings.

MIAMI DOLPHINS

Flagship station: WQAM 560 AM Announcers: Jimmy Cefalo (PBP), Jim Mandich, Joe Rose. Pre-game: Countdown to Kickoff, begins about four hours before kickoff. Other programs: Fins' Final, weeknights from 8 to 11 p.m.

MINNESOTA VIKINGS

Flagship station: KFAN 1130 AM Announcers: Paul Allen (PBP), Pete Berich. Pre-game: Vikings Football Sunday with Joe Anderson begins two hours before kickoff. Post-game: Vikings Post Game and Vikings Fanline. Other programs: Saturday Night Tailgate with Jeff Dubay and Berich from 7 to 9 p.m.; Vikings Live at Winter Park, Thursdays from 6 to 7 p.m. with Allen at the Vikings' practice facility.

NEW ENGLAND PATRIOTS

Flagship station: WBCN 104.1 FM Announcers: Gil Santos (PBP) and Gino Cappelletti Pre-game: Sylvania Pre-Game Show begins three hours before kickoff with Gary Tanguay, Scott Zolak and Andy Gresh. Post-game: New England GMC Truck Post Game begins after the conclusion of the game and lasts three hours.

NEW ORLEANS SAINTS

Flagship station: WWL 870 AM / 105.3 AM Announcers: Jim Henderson (PBP), Hokie Gajan. Post-game: Dodge Locker Room Show followed by The Point After with Bobby Hebert.

NEW YORK GIANTS

Flagship stations: WFAN 660 AM / WXRK 92.3 FM Announcers: Bob Papa (PBP), Dick Lynch and Carl Banks. Podcasts: Large amount of Giants podcasts are available on the WFAN Web site.

NEW YORK JETS

Flagship station: WEDN 1050 AM (ESPN Radio 1050) Announcers: Bob Wischusen (PBP), Marty Lyons. Pre-game: Show begins two hours before kickoff. Post-game: Show lasts for two hours after the conclusion of the game.

OAKLAND RAIDERS

Flagship station: KSFO 560 AM Announcers: Greg Papa (PBP), Tom Flores. Announcers host the pre and post-game shows as well.

PHILADELPHIA EAGLES

Flagship stations: WYSP 94.1 FM / WIP 610 AM Announcers: Merrill Reese (PBP) and Mike Quick. Pre-game: Countdown to Kickoff with Kevin Reilly and John Miller. Post-game: Eagles 5th Quarter lasts two hours after the conclusion of the game. Other programs: Monday Coaches' Show with Head Coach Andy Reid.

PITTSBURGH STEELERS

Flagship stations: WDVE 102.5 FM / WBGG 970 AM Announcers: Bill Hargrove (PBP), Tunch Illkin. Podcasts: Interviews, news and more can be found on the WDVE Web site.

SAN DIEGO CHARGERS

Flagship stations: KIOZ 105.3 FM / KLAC 570 AM Los Angeles Announcers: Josh Levin (PBP), Hank Bauer. Pre-game: Countdown to Kickoff with Jim Laslavic begins three hours prior to kickoff. Post-game: End Zone Show with Steve Quis.

SAN FRANCISCO 49ERS

Flagship stations: KSAN 107.7 (The Bone) / KNBR 680 AM (beginning in October) / KTCT 1050 AM (from opening week through October) Announcers: Joe Starky (PBP) and Gary Plummer. Pre-game: Begins three hours prior to kickoff. Other programs: 49er coaches and players have shows throughout the week including: Jeff Ulrich, Mondays at 7:15 a.m.; Mike Nolan, Tuesdays at 8:15 a.m.; Joe Neday, Thursdays 7:15 a.m.

SEATTLE SEAHAWKS

Flagship stations: KIRO 710 AM / WBSG 97.3 AM Announcers: Steve Raible (PBP) and Warren Moon. Pre-game: Pre-Game Huddle with

Dori Monson, Paul Moyer and Sam Adkins. Post-game: Hawk Talk, fan call-in show. Other programs: Seahawks Huddle each Wednesday from 7 to 9 p.m.

ST. LOUIS RAMS

Flagship station: KLOU 103.3 AM Announcers: Steve Sauard (PBP), Jim Hanifan and Malcom Biggs (SR). Other programs: Rams Rush Hour, weekdays from 7 to 8 p.m., programs include: Coach Scott Linehan on Mondays, Rams Talk on Tuesdays and Wednesdays, Steven Jackson Show on Thursdays and Jim Hanifan on Fridays.

TAMPA BAY BUCCANEERS

Flagship stations: WFUS 103.5 FM / WDAE 620 AM Announcers: Gene Deckerhoff (PBP), Dave Moore and T.J. Rives. Other programs: Coach and player shows include: Coach John Gruden, Mondays at 5 p.m.; Joey Galloway, Mondays at 6 p.m.; Ronde Barber, Tuesdays at 6 p.m.; Derrick Brooks, Wednesday at 6 p.m.; Davin Joseph, Thursdays at 6 p.m.; and Bucs Total Access, Fridays at 6 p.m.

TENNESSEE TITANS

Flagship stations: WKDF 103.3 FM Announcers: Mike Keith (PBP), Frank Wycheck. Pre-game: Titans Countdown begins two hours before kickoff. Post-game: Titans Radio Locker Room Report. Other programs: Titans' Radio's Jeff Fisher Show, Tuesday nights at 6 p.m.; Titans Report at 8:50 a.m. and 3:50 p.m. each weekday. Additionally on WKDF only, pre-game begins at 7 a.m. with Bud Ford and David Reed and the Final Drive post-game call-in show.

WASHINGTON REDSKINS

Flagship stations: WTEM 980 AM (ESPN 980) Announcers: Larry Michael (PBP), Sonny Jurgenson, Sam Huff and Rick Walker (SR).

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No Free Ride with ESK?

Among the many problems faced by radio system operators, one major headache is being sure that only authorized radios are able to use the system. Public safety operators need to be assured that only approved departmental radios can access the system and private radio service providers want to ensure that they're getting paid for every radio that makes use of their equipment.

However, it is not so uncommon for unauthorized radios to be active on radio systems. The whole phenomenon of "cloned" cellular telephones a decade ago was an example of inadequate controls on what radio equipment was allowed to utilize the cell phone network.

❖ Free Riding Vandals

Unsecured public safety networks are open to the possibility of vandals using individual "rogue" radios to create havoc. A number of recent incidents highlight this risk. For example, in March and again in August the six emergency sirens in Brunswick, Ohio, were illegally activated by what the police described as a "hacker." The unauthorized person apparently transmitted the proper start-up codes, setting off the sirens in the city of 35,000 residents.

This summer at least five handheld radios were stolen from various Dallas Fire-Rescue stations and vehicles, causing concern that they might later be used to disrupt emergency communication. Dallas Police reported an incident in August where an unknown man was calling "Code Red" and making other disruptive transmissions on police frequencies, heightening concern for officer safety. Police suspect the man was using a radio stolen from either the police or the fire department.

In October 2007 the Boston Police Department arrested a 17-year-old who they suspected of using stolen radio equipment to interfere with communications between dispatchers and officers. In that same month Pike County, Kentucky sheriff's deputies arrested two men using a stolen Elkhorn City Police radio to transmit false "shots fired, officer down" calls.

❖ EDACS Security

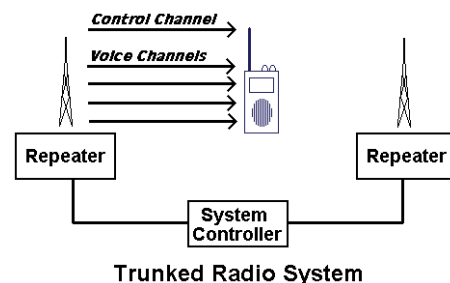
EDACS (Enhanced Digital Access Communications System) is a common public safety trunked radio system sold by M/A-COM. In 2002 they announced an add-on package called ESK (EDACS Security Key) for their EDACS product line. The intent of ESK, according to M/A-COM, was to address security weak-

nesses in fielded radio systems by doing the following:

1. Prevent unauthorized radios from accessing the system
2. Prevent trunk-tracking scanners from monitoring EDACS traffic
3. Prevent unauthorized technicians from reading the programming in an EDACS radio

ESK purports to achieve these three goals by making what amounts to a slight change in the EDACS control channel.

In an EDACS system there are two kinds of channels. The first kind is a *voice channel*, which carries the actual conversation in either analog or digital format. An outbound voice channel carries the conversation from the repeater site to the radio and the inbound voice channel carries the conversation from the radio to the repeater site.



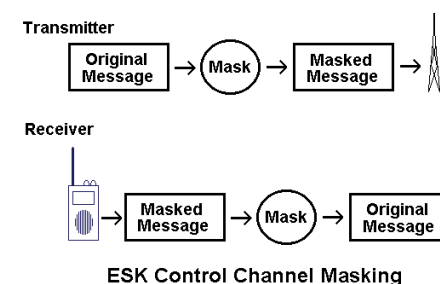
The second kind is a *control channel*, which carries instructions and responses between the radio and the system controller. The outbound control channel, transmitted continuously from the repeater, carries instructions from the controller to radios about what talkgroups are active and on which Logical Channel Numbers (LCNs) the conversations can be found. The inbound control channel carries access requests and acknowledgments from the radio to the repeater site, which forwards them to the system controller.

Regardless of whether the voice traffic is in analog or digital format, the inbound and outbound control channels carry their messages in digital form. Each message is made up of a sequence of binary digits (*bits*) of either 0 or 1. A typical message may be 40 bits long and contains various pieces of information, including a command word, status flags, a system identifier and an error code to detect whether the message was received correctly or not. EDACS messages are actually transmitted three times, just in case one or two of the messages are garbled at the receiver.

❖ EDACS Security Key (ESK)

ESK is described in U.S. Patent 7,203,318. The text of the patent specifically mentions the "problem" of scanners monitoring trunked radio systems and the earlier *tone-drop* technique to foil scanners, where the EDACS system sends a tone sequence after the end of a transmission – keeping the scanner locked on the channel while the system has moved on. Modern scanners generally recognize this tone sequence, so the tone-drop technique is no longer as effective in thwarting scanner listeners as it used to be.

The patent goes on to describe the drawbacks of fully encrypting each transmission, which would solve the scanner "problem" but incur the costs of additional hardware and software, as well as suffering the time delays involved in the encryption and decryption processes. The administrative burden of maintaining encryption keys and keeping them secret is also a complicating factor.



The patent then explains the ESK method, which is really rather simple. A small secret number called the System Security Key (SSK) is programmed into both the system controller and each radio. When a control channel message is ready to be transmitted, the SSK is used to create a *mask* that is then combined with the original message to form an encoded (*masked*) message. When this encoded message is received at the other end, the mask is removed and the original control channel message is once again available.

The implication of the patent is that the scanner will not know the SSK and therefore will not be able to remove the mask from the transmitted message. Because EDACS trunk-tracking scanners work by monitoring the outbound control channel and reacting to the instructions it finds there, if those instructions are masked the scanner will not be able to properly track conversations.

In addition, any portable or handheld radios without the correct SSK would be unable to transmit the proper access requests or receive sensible instructions from the system controller. This would have the effect of locking out unauthorized or improperly programmed radios from the ESK-equipped system.

❖ ESK Mask

The mask used in ESK is actually made up of two parts – a fixed portion and a variable portion. The fixed portion is 12 bits long and has the following sequence: 1010 0000 0000. The variable portion, which is the SSK, is 16 bits long and was intended to be something that could be set by the system operator.

The mask is applied to the message through the use of a logical operation called exclusive-OR (XOR). The 28 bits of the message (what in cryptographic terms would be called the *plaintext*) are lined up with the 28 bits of the mask (the cryptographic *key*) and each pair of bits is run through the XOR operation to produce a third 28-bit sequence. This new sequence is the masked message, to which is added error detection bits prior to transmission. On the receiving end, the error detection bits are checked, and if they're okay the same masking process is run in reverse to produce the original message.

From a cryptographic perspective, this is not strong protection at all. The 16-bit SSK provides a total of 65,536 possibilities, which in this era of multiple-GHz computers is not much of a hurdle. Even worse, from a practical perspective it appears that the agencies using ESK are all using the default SSK value, which is 16 zero bits. So there really isn't any need to even guess what the right mask might be.

However, even if the SSK were used as intended, with each agency using a different, totally random value, the small number of possibilities would make it a short and simple process for a computer to run through all 65,536 combinations and determine the correct mask. Because the control channel messages have a well-known format, such a process could try each possible SSK against a masked message and check if the result matched a known or expected control channel message. In cryptography this is called a *plaintext attack* and is a well-known technique to determine an unknown key.

The ESK patent does mention the possibility of changing the SSK on a more frequent basis, even as often as after each transmission. This may create slightly more work for a listener to overcome, but would add significant complexity to the ESK system, as it would need a reliable method to properly synchronize the system controller and every radio with the correct SSK each time it changed.

❖ ESK Capable Scanners

Where will you find ESK? The city of Denver, Colorado switched on ESK in August, following the nearby town of Lakewood. Other organizations using ESK include the Florida Statewide Law Enforcement Radio System (SLERS), El Paso and Bexar Counties in Texas, as well as the Dallas/Fort Worth Airport.

❖ GRE

The GRE PSR-500 and PSR-600 scanners are able to track EDACS ESK out of the box, automatically detecting whether ESK unmasking is necessary. If you already own a GRE scanner, be sure to check www.gre-america.com/support/ for recent firmware updates that may improve the performance of your model.

❖ Uniden Updates

In August, Uniden announced plans for a series of firmware updates that will include ESK capability for the BCD396T and the BCD996T. These firmware updates will also include other features and improvements, including fully automatic adjustment of APCO Project 25 threshold detection and moving hidden menu items into the main menu structure.

The updates are intended to be available according to the following schedule, although any problems found during testing may delay the actual release date.

Availability	Scanners
September 30, 2008	BCD396T and BCD996T
November 20, 2008	BC246T and BCT15
December 31, 2008	BCT8 and BC898T
January 31, 2009	BC296D, BC796D and BR330T

If you have one of these scanners, keep checking at www.uniden.com to see if the update for your unit is available for download. Also see *What's New* for Uniden's just-announced BC346XT and BC396XT.

❖ Private Network Bootlegging

Operators of private radio systems are not so much concerned about fake transmissions as they are about getting paid for the number of radios using the system. A typical arrangement is for a customer to pay a monthly subscription fee for each radio they use. Because many radio systems are unable to automatically distinguish legitimate radios from "bootleg" units, it is possible for a customer to purchase radios from a third party and use them on the system without the operator's knowledge.

Newer radio system technology is making this practice more difficult. For example, Logic Trunked Radio (LTR) is common trunked radio protocol used by many private radio system operators. When an LTR radio attempts to access a system, it does not have to identify itself. The LTR controller processes transmissions from bootleg radios just as it would from a legitimate radio.

An upgrade to the LTR protocol, called *PassPort*, allows the system operator to network multiple repeater sites. An additional benefit for the operator is that the newer *PassPort* controller requires the use of individual electronic serial numbers (ESNs) for each radio that accesses the system. These ESNs are registered with the system when the radio is put into service and checked by the controller when in use. Transmissions from legitimate radios will have an ESN that is known to the system, and will be processed normally.

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Transmissions from bootleg radios will have an ESN that is not known to the controller and will be rejected.

❖ APCO Scanning

Dear Dan,

I wish to ask you about APCO 25 and scanners to monitor it.

I live in St. Louis and the city's 800 MHz TRS is in the process of going digital. I can already feel the right side of my body twitching as I think about spending \$500 plus on a new scanner. If my memory serves me right, one of the first digital capable scanners had a "card" that was installed or inserted to make it work. My guess is the card had all the electronic memory to receive and decode P-25 signals. Here is the question I am going to pose for you.

Would it be possible for a scanner company to manufacture a "separate" decoding device that can be hooked up to a non-digital compliant scanner so it can receive and decode P-25 signals? For example, something like a "modem" we use for computers. Real simple, fairly cheap (under \$250) (prefer under \$200) and NOT a burden on the scanner enthusiasts that are financially strained. Just wire it up to the antenna port with a short cable and bingo.

I am serious about this. I think it could be done. And I think it should be done. What do you think?

*Thanks for your time,
Jeff in St. Louis*

Jeff, your memory is pretty good. Uniden sold four scanner models with plug-in cards to support APCO Project 25 (P25) systems. The BC250D handheld and the BC785D base/mobile, introduced almost exactly six years ago, could decode P25 transmissions using a BCi25D card. A year later, the BC296D handheld and BC796D base/mobile used an improved BCi96D plug-in card to provide P25 capability, including tracking on 9600-baud systems. Each of these cards was designed specifically for the corresponding scanner models – they will not work with other units.

APCO Project 25



- 9600 bits per second
- IMBE vocoder
- QPSK-C modulation

The use of cards in these scanners appears to have been primarily a financial decision on the part of Uniden. At the time these scanners were designed it wasn't entirely clear how many customers would actually want (and pay for!) the P25 capability. The cards provided a way for Uniden to hedge their bets, since the scanner will track other systems just fine without the card.

More importantly, perhaps, was a licensing issue. Although the P25 standards are open and available for anyone to review, the Common Air Interface (CAI) specifies a proprietary vocoder (voice encoder/decoder) to convert legible sound into digital form and back again. The intellectual property rights to this vocoder are owned and controlled by a Massachusetts-based company called Digital Voice Systems, Inc. (DVS), who now license both software and hardware versions. Although I certainly haven't seen the contract, I suspect that Uniden agreed to pay a per-unit license fee for each card they sold.

There aren't many examples of external devices that can monitor P25 systems. About the only device that comes to mind, other than specialized and very expensive test gear, is the AOR ARD25. I reviewed this product when it was introduced in 2004 (you can read my review on the web at www.monitoringtimes.com/html/mtrevusep04.html), but it has some limitations that might make it unsuitable for your purposes. First of all, the list price is about double what you mention, running just under \$400. Although it is very powerful hardware platform, housing a CPU, a DSP and an FPGA (three different types of integrated circuits with significant processing capability), it suffers from a lack of software to take advantage of these resources. For instance, firmware limitations prevent it from following trunked conversations or decoding CQPSK modulation found in newer P25 systems. The ARD25 firmware also lacks the automatic tuning and level

adjustment features found in recent scanners.

The DVS vocoder in the ARD25 is in firmware rather than hardware, but again I expect that AOR agreed to pay a royalty to DVS for each ARD25 sold.

From a usability perspective, it requires a radio receiver (not just a scanner) with a special kind of output called an IF (intermediate frequency), specifically one at 10.7 MHz. This can be found on several AOR and ICOM receivers, but is not at all common on the more popular Uniden or Radio Shack products.

So, there are both technical and financial challenges that must be met in order for a consumer-level add-on P25 device to come to market at the price point you desire. I would certainly support the production of such a device, but at present I am not aware of a serious effort to create one.

❖ St. Louis P25 System

The City of St. Louis is cutting over to a new, fully digital APCO Project 25 trunked radio system. While the transfer is underway, here are the operating frequencies and some of the known law enforcement talkgroups. Note that there are three patrol divisions in the city:

Division	Districts
North	6, 7, 8
Central	4, 5, 9
South	1, 2, 3

There are two licensed repeater sites in the FCC database, one at 1200 Clark Avenue (Police Department Headquarters) and the other at 3157 Sublette Avenue (South Patrol Division). Frequencies are:

856.4375, 856.4625, 856.4875, 856.7125, 856.7375, 857.4375, 857.4625, 857.4875, 857.7125, 858.4375, 858.4625, 858.4875, 858.7125, 858.9375, 859.4375, 859.4625, 859.4875, 859.7125, 860.4375, 860.4625, 860.4875 and 860.7125 MHz.

Decimal	Hex	Description
10001	2711	Police Information (South)
10002	2712	Police Dispatch (Districts 1 and 2)
10003	2713	Police Dispatch (District 3)
10004	2714	Police Dispatch (Districts 4 and 5)
10005	2715	Police Information (North)
10006	2716	Police Districts 6 & 8
10007	2717	Police District 7
10008	2718	Police Dispatch (District 9)
10009	2719	Strategic Air Command
10012	271C	Tactical A (unit-to-unit)
10013	271D	Tactical B (Special Situations)
10014	271E	Tactical C (unit-to-unit)
10019	2723	Police K9
10024	2728	Police Recon (South Patrol)
10029	272D	Police Recon (North Patrol)

That's all for this month. More information is available on my web site at www.signalharbor.com, including detailed APCO-25 information and scanner firmware update links. Please send your questions, comments, frequency lists and product ideas to me at danveeneman@monitoringtimes.com. Until next time, Happy Thanksgiving and happy scanning!

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25,000-512,000 MHz., 764,000-775,9875 MHz., 794,000-823,9875 MHz., 849,0125-868,9765 MHz., 894,0125-956,000 MHz., 1240,000 MHz - 1300,000 MHz.

The handheld BCD396T scanner was designed for National Security/Emergency Preparedness (NS/EP) and homeland security use with new features such as **Fire Tone Out Decoder**. This feature lets you set the BCD396T to alert if your selected two-tone sequential paging tones are received. Ideal for on-call firefighters, emergency response staff and for activating individual scanners used for incident management and population attack warning.

Close Call Radio Frequency Capture - Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. Useful for intelligence agencies for use at events where you don't have advance notice or knowledge of the radio communications systems and assets you need to intercept. The BCD396T scanner is designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS, LTR and EDACS analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. **Dynamically Allocated Channel Memory** - The BCD396T scanner's memory is organized so that it more closely matches how radio systems actually work. Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 3,000 channels are typical but **over 6,000 channels are possible** depending on the scanner features used. You can also easily determine how much memory you have used and how much memory you have left. **Preprogrammed Systems** - The BCD396T is preprogrammed with over 400 channels covering police, fire and ambulance operations in the 25 most populated counties in the United States, plus the most popular digital systems. **3 AA NiMH or Alkaline battery operation and Charger** - 3 AA battery operation - The BCD396T includes 3 premium 2,300 mAh Nickel Metal Hydride AA batteries to give you the most economical power option available. You may also operate the BCD396D using 3 AA alkaline batteries. **Unique Data Skip** - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. **Memory Backup** - If the battery completely discharges or if power is disconnected, the frequencies programmed in the BCD396T scanner are retained in memory. **Manual Channel Access** - Go directly to any channel. **LCD Back Light** - A blue LCD light remains on when the back light key is pressed. **Autolight** - Automatically turns the blue LCD backlight on when your scanner stops on a transmission. **Battery Save** - In manual mode, the BCD396T automatically reduces its power requirements to extend the battery's charge. **Attenuator** - Reduces the signal strength to help prevent signal overload. The BCD396T also works as a conventional scanner to continuously monitor many radio conversations even though the message is switching frequencies. The BCD396T comes with AC adapter, 3 AA nickel metal hydride batteries, belt clip, flexible rubber antenna, wrist strap, SMA/BNC adapter, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO or ESAS systems. Order on-line at www.usascan.com or call 1-800-USA-SCAN.



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Frequency Coverage:

25,000-54,000 MHz., 108,000-174,000 MHz., 216,000-224,9800 MHz., 400,000-512,000 MHz., 806,000-823,9875 MHz., 849,0125-868,9875 MHz., 894,0125-956,000 MHz., 1240,000 MHz - 1300,000 MHz.

The handheld BC246T TrunkTracker scanner has so many features, we recommend you visit our web site at www.usascan.com and download the free owner's manual. Popular features include **Close Call Radio Frequency Capture** - Bearcat exclusive technology locks onto nearby radio transmissions, even if you haven't programmed anything into your scanner. **Dynamically Allocated Channel Memory** - Organize channels any way you want, using Uniden's exclusive dynamic memory management system. 1,600 channels are typical but **over 2,500 channels are possible** depending on the scanner features used. You can also easily determine how much memory is used. **Preprogrammed Service Search (10)** - Makes it easy to find interesting frequencies used by public safety, news media TV broadcast audio, Amateur (ham) radio, CB radio, Family Radio Service, special low power, railroad, aircraft, marine, racing and weather frequencies. **Quick Keys** - allow you to select systems and groups by pressing a single key. **Text Tagging** - Name each system, group, channel, talk group



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AOR AR5000A+3B Wide Band 10 KHz to 3 GHz receiver.....	\$2,599.95
AOR AR8200 Mark IIIB Wide Band handheld scanner.....	\$594.95
AOR AR8600 Mark II Wide Band receiver.....	\$899.95
AOR AR-ONE Government/Export sales only 10 KHz-3 GHz.....	\$4,489.95
Scantail Gold For Windows Software.....	\$99.95
Scantail Gold For Windows Surveillance Edition.....	\$159.95

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Power Line Networking Battle Continues

Utility listeners in the United Kingdom have won an early skirmish in the turf war over who is going to own the high-frequency (HF; short wave) spectrum. Ofcom, their version of the US Federal Communications Commission (FCC), has been visiting people who complain of excessive interference from power line communications (PLC) networking adapters. These are being furnished with a home digital video system offered by British Telecom (BT). In response, BT has been equipping its subscribers, one case at a time, with traditional network cable or wireless solutions.

The major ongoing problem in the UK is that the country is being flooded with these devices, meaning that as soon as BT replaces them in one home, another pair starts up somewhere else. Obviously, the underlying technology continues to become entrenched.

Some Background

For our US readers who are not up to speed, the problem is wideband HF emission from digital networking adapters attached to home power lines. Typically, this emission absolutely blocks reception over a band that can reach two to thirty megahertz (MHz), except for whatever frequencies the devices have been configured to skip. The affected radius can be in the hundreds of feet.

This is not the "Broadband Over Power Lines" (BPL) that you might have heard of. It is better referred to as PLC - Power Line Communications. Unlike BPL, which uses the power company's wires to get broadband data into a home, this PLC variant uses your own house wiring to get data (usually digital high-definition video) from the computer router to a TV in another room.

Those with some theoretical background have already figured out the problem. Connecting any source of high-frequency energy with a power in the milliwatt-to-watt range to an

ungrounded wire, creates a transmitting antenna, and in this case a very good one. There is, unfortunately, no way that broadband data can be transmitted through the unshielded AC mains without this destructive side effect. It's not hard to imagine our densely populated regions becoming essentially HF exclusion zones.

The offending technology is offered by two broad industry alliances. One, HomePlug, only interferes with HF when data is actually being transmitted. If video is being streamed, or a lot of randomly buzzing units are nearby, this obviously won't help much. The other, DS2, transmits *all* the time, with hundreds of carriers.

In order to stay marginally in compliance with electromagnetic compatibility standards, both systems have offered a means to notch out important HF frequencies. Most, though not all, of these adapter pairs come with ham radio bands already notched. DS2 offers a more flexible notching scheme that can protect other frequencies. It requires complex programming, and it is not well understood or implemented by end users.

Limited Protection for Listeners

What progress has been made is largely due to heroic efforts of various national amateur radio groups such as the American Radio Relay League (ARRL). Your editor is an ARRL member, and thinks you should be, too, if you have a ham radio license.

Short wave *broadcast* listeners have a limited protection under international standards originally enacted to prevent jamming, or to resolve just such issues with badly designed consumer electronics. There has also been some success with new-generation technology that detects loud short wave broadcast signals at the power ground, dynamically inserting the appropriate notches.

Obviously, this does absolutely nothing to protect weak-signal reception. Also, the video system sold by BT does not have this feature. A better long-term solution would be to use different spectrum, or lower power, but neither is possible with current technology.

Unfortunately, we utility fans are pretty much on our own. There is no inherent legal protection for an activity which involves the interception of transmissions not intended for the public at large. About the only utili-

ties aimed at the public are HF time signals, though present power line network configurations block these as well.

US Listeners: Be Prepared

In the United States, previous schemes to send data through power lines have not been commercially successful for the most part. They've lost out badly to cable modems, digital subscriber lines (DSL), and the ubiquitous wi-fi. My radio shack is full of these devices, and they cause little or no trouble for reception on HF.

The danger increases, however, as more people start subscribing to high-definition video-on-demand services. Power line networking is usually considered the ideal solution for getting this video around a building. The speed claimed in manufacturer specifications sounds ideal for this application. In the real world, however, this spec fights a number of complex technical issues that sound more like the writings of Nikola Tesla. As they say in the car commercials, your mileage will vary.

All the usual companies make these for the US as well, and we are probably only one marketing campaign away from a situation similar to the UK. Unfortunately, we probably have less of a legal resource in our underfunded and politicized FCC. Our major protection comes from the familiar FCC Part 15 language that's in the front of every computer manual these days. It requires users to take necessary steps if interference occurs. I do not, however, relish the idea of banging on doors in the typically paranoid, American city, trying to convince possibly armed neighbors that the X-rated video in their bedroom is disrupting my late-night mad science.

It's a mess, and I wish I had a more optimistic outlook. Unfortunately, some kind of united voice is required, and this is going to take some organizing on our part.

Right now, the best organizing effort that I have seen is the UKQRM (United Kingdom Interference) group on Yahoo. It has done a great job of getting interference cases resolved and providing a common information pool for those fighting to keep at least some of HF for long-distance radio communication. It also has excellent videos explaining the problem. We will probably, at some point, require something similar in the United States.

Those wanting to see the future can join UKQRM at <http://groups.yahoo.com/group/UKQRM/>.



This picture is of the exact model PLC units that caused the problems in the UK. Someone was advertising them on the internet as from their BT Vision kit. In all complaint cases, the British Ofcom has simply required that they be taken off the air.

ABBREVIATIONS USED IN THIS COLUMN

AFB.....	Air Force Base
ALE.....	Automatic Link Establishment
AM.....	Amplitude Modulation
CAMSLANT.....	Communications Area Master Station, Atlantic
CAMSPAC.....	Communications Area Master Station, Pacific
CAP.....	US Civil Air Patrol
COTHEN.....	Customs Over-The-Horizon Enforcement Network
CW.....	On-off keyed "Continuous Wave" Morse telegraphy
E10.....	Israeli female phonetic-letter calls and messages
EAM.....	Emergency Action Message
FAX.....	Radiofacsimile
FEMA.....	US Federal Emergency Management Agency
HFDL.....	High-Frequency Data Link
HF-GCS.....	High-Frequency Global Communication System
M08a.....	Cuban 3-msg CW/MCW, ANDUWRIGHT = 1-0
M51.....	French military Morse training net, CW drill messages
MARS.....	Military Affiliate Radio System
MCW.....	Modulated CW, alone or as audio tones
MX.....	Generic for Russian single-letter beacons/markers
NAT-B.....	North Atlantic air route control, family B
PSK.....	Phase-Shift Keying
RDFT.....	Redundant Digital File Transfer; 8-tone PSK
RTTY.....	Radio Teletype
Selcal.....	Selective Calling
SHARES.....	Shared Resources, US federal frequency pool
SITOR-A.....	Simplex Telex Over Radio, mode A
SITOR-B.....	Simplex Telex Over Radio, mode B
SK01.....	Generic for Cuban numbers in ham digital modes
UK.....	United Kingdom
Unid.....	Unidentified
US.....	United States
USAF.....	US Air Force
USCG.....	US Coast Guard
V02a.....	Cuban "Atencion" Spanish numbers, 3-msg format

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations have their ENIGMA (European Numbers Information Gathering and Monitoring Association) designators in ().

2311.0	Arklow Rebel-Irish registry merchant ship, callsign EIVG, checking into the Arklow net at 1923. (Michel Lacroix-France)
2872.0	Gander-Gander Radio, NFD, Canada, position check with flight EI AI 001, at 0445. Gander, position from Air India 140, at 0452. (Allan Stern-FL)
3137.0	Andrews-USAF, Andrews AFB, MD, patching Team 56 (KC-10A tanker) to McGuire AFB command post, at 0133. (MDmonitor-MD)
3345.0	WUK437-US Army Corps of Engineers, CA, sounding in ALE, also on 5015, 5400, 5437.5, and 6020, at 2037. (Hugh Stegman-CA)
3390.0	NNN00NX-US Navy/Marine Corps MARS, net control at 0109. (Tom Severt-KS)
3450.0	"OK"-Low-power CW hobby beacon, OK, at 0110. (Severt-KS)
4007.0	NNN0LHK-US Navy/Marine Corps MARS net, at 0112. (Severt-KS)
4318.0	NMG-USCG, New Orleans, text weather forecast in FAX, at 0245. (Severt-KS)
4325.9	"R"-Russian CW single-letter marker (MX), Izhevsk, also on 5465.9, at 1956. (Ary Boender-Netherlands)
4490.0	KNY58 -US National Communications System, ALE sounding on SHARES Control Net channel 3, at 1753. (Larry Van Horn-NC)
4506.0	Iowa CAP 101-CAP net with "Iowa CAP 102 mobile," at 0134. (Severt-KS)
4780.0	INDOPS -US National Guard, Indianapolis, IN, ALE sounding at 1811. (Van Horn-NC)
5201.0	Unid-Russian Air Defense, possibly Moscow area, sending time-stamped tracking data items in a 14-figure CW format, at 1925. (Boender-Netherlands)
5221.5	Unid-Russian Air Defense, CW tracking data at 0215. (PPA-Netherlands)
5253.7	"D"-Russian Navy CW single-letter cluster beacon (MX), Sev-

5253.9	astopol, also on 7039.7, 10871.7. and 13527.7, at 1950. (Boender-Netherlands)
5430.0	"S"-MX, Severomorsk, CW single letter, also on 7039.9 and 10871.9, at 1950. (Boender-Netherlands)
5598.0	ART-Israeli intelligence (E10), AM identifier and message, also on 6986, at 1935. (Boender-Netherlands)
5616.0	New York, clearing Iberia 401 to climb to flight level 370, at 0526. (Stern-FL)
5649.0	Gander Radio-NAT-B, Gander, NFD, position check with USAF charter transport Reach 563, advised aircraft to contact Santa Maria on 5598 or 3016 upon reaching 45 degrees north, at 0045. (MDmonitor-MD) Gander, selcal check with Delta 40, at 0210. (Severt-KS)
5696.0	F-GRSQ-Star/XL Airlines Airbus A330, answered selcal EP-BL from Shanwick, at 0652. (Lacroix-France) Malev 090-Malev Airlines Boeing 767-306ER, registration HA-LHC, answered selcal CS-KQ at 2040. (Patrice Privat-France)
5711.0	Coast Guard 2134-USCG HU-25A, relaying ops-normal from Coast Guard 2120 to CAMSLANT, at 0153. (Mark Cleary-SC)
5732.0	AAT3BF-US Army MARS, DE, ALE sounding on SHARES Co-ordination Net channel 4, also on 9106 (channel 5), and 11217 (channel 6), at 1652. (Van Horn-NC)
5828.5	LNT-USCG, VA, raised J34 in ALE, then voice as CAMSLANT to take ops-normal from Juliet 34, at 0111. (Severt-KS)
5838.5	Unid-French CW training (M51), drill message "NR 36 S 01 18:07 19 8 60 B T," at 2017. (Boender-Netherlands)
5883.0	FAV22-M51, CW drill message "NR 83 J 31 22:19:13..." at 2031. (MPJ-UK)
5898.0	Cuban Spanish female AM numbers (V02a), in progress at 0604. (Severt-KS)
6467.0	Cuban V02a, AM callup 97991 43081 76702 and messages in 5-figure groups, at 0800. (Severt-KS)
6535.0	VTG5-Indian Navy, Mumbai, CW marker at 1751. (PPA-Netherlands)
6586.0	Air Mediterranee 6652-Airbus A312-200, answered selcal EF-DH from Dakar, at 0343. (ALF-Germany)
6640.0	Air France 493-Boeing 747, registration F-GITD, answered selcal AF-BS from New York, at 0348. (ALF-Germany) New York, clearing American 955 to a higher altitude, at 0458. (Stern-FL)
6661.0	Teal 71-USAF Reserve 53rd Weather Recon "Hurricane Hunter," a WC-130J on Gustav, position for New York at 0346. (Stern-FL)
6806.0	VP-BUO-Aeroflot Airbus A319, flight SU0228, HFDL position for Riverhead, NY at 2329. (MPJ-UK)
6809.0	0011ARCAP-CAP, AR, ALE sounding at 1836. (Van Horn-NC)
6846.0	FC6-FEMA Region 6, Denton, TX, ALE sounding, also on 7348, 9462, and 13446, at 1911. (Van Horn-NC)
6906.5	YGAU-Unknown Russian military, CW messages to YGAU, NT8V, and 9HNA, at 1932. (MPJ-UK)
6921.0	R23585-US Army helicopter, working T12244 (1-244th Aviation), ALE at 1841. (Privat-France)
6992.0	NNN0VDG-US Navy/Marine Corps MARS, FL, SHARES hurricane net control with stations in FL and MD, went to 3172 kHz at 0000. (Cleary-SC)
7527.0	9857-Turkish Red Crescent, ALE sounding at 1853. (PPA-Netherlands)
7599.0	AAA-Israeli Air Force, Tel Aviv, ALE sounding, also on 16202, at 2021. (MPJ-UK)
7601.0	EST-COTHE Eastern Remote Communications Node, raised D31 in ALE, then voice as Hammer (US Customs, CA), working Omaha 31SK (US Customs P-3B mission), clear and secure, at 0014. (Cleary-SC)
7664.0	OPERACYJNY-UN Polish Kosovo Forces, raised BXPJANKOVIC in ALE, then went to secure voice, at 0635. (PPA-Netherlands)
7700.0	LAN-Georgian Military, link quality assessment with BZR, FAF, and TGC, at 0105. (ALF-Germany)
	R1W-Russian Navy, Moscow, CW data link coordination with RFH77, at 0300. (ALF-Germany)
	OMEGA70RS1702P-Probable Uzbek Army, working OME-

- GA10RS1702P in ALE, at 2045. (MPJ-UK)
- 7805.0 NA1SH-New Hampshire Bureau of Emergency Management, Nashua, ALE sounding at 0201. (ALF-Germany)
- 7887.0 Cuban V02a, AM in progress at 2009. (Cam Castillo-Panama)
- 7918.0 YHF2-E10 null-message format, AM identifier only, also on 9130, at 1920. (Boender-Netherlands)
- 8012.0 RIC-CAP Region 2, Richmond, VA, ALE sounding at 1801. (Van Horn-NC)
- 8023.0 123CDCS27-US Centers for Disease Control, calling 001CD-CNHQ, GA, National Public Health Radio Network, ALE at 1608. (Jack Metcalfe-KY)
- 8037.0 L060AN-US National Guard, Baton Rouge, LA, Gustav-related ALE call to HQ703N, National Guard Readiness Center, VA, at 1919. (Van Horn-NC)
- 8050.0 BABORIGAME-Mexican military drug operations, Ft. Baborigame, Chihuahua, calling PISTON, ALE at 0327. (Stegman-CA)
- 8072.0 IN4N-Russian military, CW messages to 5PKX and UUNC, at 0736. (PPA-Netherlands)
- 8097.0 Cuban CW "Cut Numbers" (M08a), messages sent as 5-letter groups, at 1800. (Sevart-KS)
- 8107.0 XSS-UK Defence High-Frequency Communications System, ALE sounding, also 8108, 8182, 10344.5, 10575, 10893.5, and 12230; at 1925. (MPJ-UK)
- 8136.0 RMW32-Russian military, CW traffic with RMW36, at 0709. (PPA-Netherlands)
- 8178.5 Shotgun 63-Unknown US military, radio check with Shotgun 31 at 1532. (Metcalfe-KY)
- 8301.6 Sector San Juan-USCG, Puerto Rico, working Rescue 21 (Coast Guard 2121, an HU-25A), on a search at 0019. (Cleary-SC)
- 8345.0 RFH77-Russian Navy, CW operator chatter with unknown station, at 0237. (ALF-Germany)
- 8419.0 WLO-ShipCom, Mobile, AL, CW identifier in SITOR-A sync bursts, also on 8421 and 8423.5, at 1950. (Jim-GA)
- 8424.0 SVO-Olympia Radio, Greece, SITOR-B news in Greek, at 2102. (Lacroix-France)
- 8646.0 VTP6-Indian Navy, Vishakhapatnam, CW message in 4-figure groups at 1626. (PPA-Netherlands)
- 8728.0 3AC-Monaco Radio, maritime weather broadcast at 0813. (Lacroix-France)
- 8806.0 WLO-ShipCom, AL, voice-synthesized weather and traffic list at 1603, again at 1705. (Jim-GA)
- 8864.0 Gander-NAT-B, position from Zesty 14 (USAF Coronet mission), advised aircraft to contact Shanwick at 47 degrees north, at 2337. (MDmonitor-MD)
- 8879.0 MK0042-Mauritius Airlines, position for Seychelles, at 2120. (Privat-France)
- 8912.0 PAC-USCG, CA, raised F40 in ALE, then voice as CAMSPAC working Foxtrot 40 (USCG HU-25), at 2221. (Cleary-SC)
- 8918.0 Hunter 02-UK Royal Air Force Nimrod MR2, working New York at 0138. (Stern-FL)
- 8971.0 Golden Hawk-US Navy, ME, passing arrival weather to P-3C Fighting Tiger 22, at 0100. (MDmonitor-MD)
- 8983.0 CAMSLANT-USCG, VA, passing current hurricane position to Coast Guard 2120 (HU-25A Gustav mission), at 2109. (Cleary-SC)
- 8992.0 Puerto Rico-USAF HF-GCS, running a patch for Larma 31 (UK Royal Air Force), at 2359. (MDmonitor-MD)
- 9025.0 Ascot 7082-UK Royal Air Force, ALE-initiated patch to unknown weather office regarding arrival in Curacao, at 2207. (MDmonitor-MD)
- 9031.0 Syracuse-Possible US Navy, telling Rectangle to change frequency, at 0206. (MDmonitor-MD)
- 9106.0 AAT3BF-US Army MARS, DE, ALE sounding on SHARES Coordination Net channel 5, at 1650. (Van Horn-NC)
- 9135.0 3261-Turkish Red Crescent, ALE sounding at 1854. (PPA-Netherlands)
- 9145.0 RIW-Russian Navy headquarters, Moscow, working warship RGZ58, CW at 1813. (MPJ-UK)
- 9153.0 Cuban M08a, MCW messages in progress, at 0605. (Sevart-KS)
- 9262.3 Temptation-US military, working Lighthouse, clear and secure voice, at 1635. (Metcalfe-KY)
- 9360.0 OXT-Danish weather office, Skamlebaek, FAX ice chart at 1210. (MPJ-UK)
- 9414.5 494FEMAUX-FEMA Region 4 Auxiliary Station WGY 9494, working 033CDCS22, National Public Health Radio Network, ALE at 0316. (Stegman-CA)
- 10081.0 "01"-San Francisco HF DL ground station, Dixon, CA, squitters and position from NW0803, at 1700. (Jim-GA)
- 10087.0 B-18617-China Airlines Boeing 737, HF DL log-on with Krasnoyarsk ground station, Russia, at 2312. (MPJ-UK)
- 10536.0 CFH-Canadian Forces METOC (Meteorological and Oceanic) Centre, Halifax, NS, RTTY identifier and weather at 1425. CFH, FAX wave forecast chart at 2002. (Jim-GA)
- 10780.0 Cape Radio-USAF, Cape Canaveral Air Force Station, FL, attempting contact with C-130 Rican 44 but too weak, at 1749. (Stern-FL)
- 10816.5 T060XN-Texas National Guard, Camp Mabry, TX, calling A040LN Montgomery, AL, in ALE, also on 13568, at 1945. (Van Horn-NC)
- 10863.0 Unid-M51, drill messages consisting of 100 5-letter groups at 0129. (Sevart-KS)
- 10872.0 "C"-MX, Moscow, CW single letter at 1953. (Boender-Netherlands)
- 10921.0 RMP-Russian Navy Baltic Fleet, Kaliningrad, listening on 11429 for RFH61, CW at 1620. (ALF-Germany)
- 10945.0 CFH-Canadian Forces, Halifax, NS, idler and periodic RTTY marker "NAWS DE CFH ZKR F1 2822 3394 4185 6254 8303 12380 AR," at 1400. (Jim-GA)
- 11175.0 Andrews-USAF HF-GCS control point, Andrews AFB, MD, with a long 137-character EAM, at 1625. Rican 44-Same US C-130 from 10780, attempting HF-GCS patch to San Juan, Puerto Rico, at 1755. (Stern-FL) Outboard-Possible US military airborne command post, 28-character EAM at 1730. Vocation-US military, patch to Monogram via Andrews HF-GCS at 2250. (Jeff Haverlah-TX)
- 11232.0 Rescue 40-USCG Coast Guard 2140, an HU-25C on hurricane assessment, patch to Sheppard AFB at 2026. (Cleary-SC)
- 11300.0 Air Mauritius 41, air traffic control with Khartoum at 2043. (Lacroix-France)
- 11387.0 "04"-Riverhead HF DL ground station, NY, uplinks and squitters at 1315. (Jim-GA) UP0219-United Parcel Service freighter, HF DL position for Riverhead, at 1535. (Lacroix-France)
- 11429.0 RFH61-Russian Navy, working RMP on 10921, CW at 1610. (ALF-Germany)
- 11435.0 Cuban RDFT (SK01), passing file 24732764.txt at 0600. (Sevart-KS)
- 11475.0 GAO-Algerian Embassy, Niger, ALE sounding at 1400. (Lacroix-France)
- 11494.0 PAC-USCG CAMSPAC, raised 502 (Coast Guard 1502, HC-130H) in ALE, then voice position check at 1852. (MDmonitor-MD) Coast Guard 1701-USCG HC-130H on Gustav, patch to Clearwater Air, FL, via Service Center (COTHEN, FL), at 2327. (Cleary-SC)
- 11532.0 Cuban RDFT (SK01), weak but probably a repeat of 0600, at 0637. (Sevart-KS)
- 12087.0 R27069-US Army aircraft calling T1Z147 (National Guard 1-147th Aviation, WI), ALE at 1807. (Van Horn-NC)
- 12593.0 DDZL-Unknown Russian military, CW traffic with GMIM, BT3Y, and ZQ GK, at 1309. (MPJ-UK)
- 12637.5 XSG-Shanghai Radio, China, SITOR-B broadcast at 1351. (Lacroix-France)
- 13215.0 JNR-USAF HF-GCS, Salinas, Puerto Rico, ALE sounding at 1215. (MPJ-UK)
- 13479.0 REA4-Russian Air Force, Moscow, frequency-shifted Morse marker at 1129. (MPJ-UK)
- 13927.0 Hobby 24-USAF Reserve 53rd Weather Recon, possibly related to tropical storm Fay mission support, morale patch via MARS AFA4DD, TX, at 2145. (Stern-FL)
- 14556.0 RIW-Russian Navy, Moscow, working RFH61 (ship transmitting on 11747), then message in 5-letter groups to RGZ58, CW at 1231. (MPJ-UK)
- 14780.0 GWPWF33-Brazilian Navy, calling GWPWJN, vessel *Julio de Noronha*, at 1926. (Lacroix-France)
- 15094.0 USARC5-Probable US American Red Cross, calling PR13 in ALE on SHARES net channel 7, at 1847. (Van Horn-NC)
- 15867.0 I49-US Customs Cessna 550, ALE sounding at 1523. (MDmonitor-MD)
- 15988.0 DDK7-German weather office, Pinneberg, RTTY weather at 1320. (MPJ-UK)
- 16540.0 Unid-Male calling Paricoy in English and Tagalog, likely an unauthorized Philippine maritime link, at 1609. (MDmonitor-MD)
- 16822.0 UDK2-Murmansk Radio, Russia, CW identifier in SITOR-A sync bursts, at 1324. (MPJ-UK)
- 17435.0 Cuban RDFT (SK01), passing file 57614491.txt, at 1754. (Sevart-KS)

NATO RTTY and More ALE

The summer months are often difficult enough to bag some new digital stations, but the summer of 2008 proved more difficult than ever due to the poor condition of the ionosphere. As you'll probably recall from a recent article in *MT* and this month's propagation forecast, a number of experts are now doubting the much-heralded rise of Solar Cycle 24 and expect us to remain in the HF propagation doldrums for a while longer.

The net result of last summer's conditions were that daytime frequencies above 15MHz were often not available and nighttime frequencies below 8MHz were often so noisy due to lightning as to be virtually unlistenable.

No matter, what's a few sunspots between friends? Let's soldier on and see what's out there on the digital dial, poking its head out of the noise...

❖ NATO Encrypted RTTY

Chances are that you've come across some newbie posting the question, "I can hear a very strong RTTY signal but it always decodes as gibberish. I was looking forward to seeing press or weather messages." Admit it: we've all been there!

Sometimes, if their equipment allows, the hapless starter will have correctly measured the signal with the telltale 75bd speed and 850Hz shift. They may even have noticed that the signal sometimes stops and then restarts with a period of a "faster sounding" signal.

These are all the hallmarks of (most usually, but not always) a NATO encrypted RTTY signal. Many have been long-term inhabitants of the frequencies listed below. Many are also broadcasts, designed to be received by a large number of outstations and hence stay up 24hrs and may also occupy multiple frequencies sending the same messages.

Here are the usual culprits mentioned in these reports:

The UK Navy's AMCC Northwood MATELO broadcast (callsign MKL): 23238, 11213, 8988, 6759, 4732 kHz via the Inskip transmitter site and 82.8 kHz via Crimond.

The US Navy's broadcast from Florida's Saddlebunch Key (callsign unknown) and other sites on the West Coast: 16264.5, 15959, 12120, 9085, 9030 and 5340kHz

Just to prove the sheer numbers of these stations still on the air, here's a selection of frequencies between 2 and 10 MHz carrying the same signal.

2298.75, 2526, 2815, 2847, 3038, 3085, 3090, 3103, 3133, 4170, 4279, 4506, 4623,

4711, 4882, 4950, 5081.4, 5177, 5179.5, 5259.5, 5340, 5374.5, 5602, 5707, 5716, 5870, 5964, 6489, 6702, 6729, 6753, 6875, 6942, 6955, 7573, 7593, 7792, 8014, 8017, 8028, 8052, 8083, 8170, 8815, 8991, 9000, 9015, 9075, 9143, 9200, 9300, 9338, 9405, 9960, 9962, 10106 kHz

In most cases, in tuning into these signals after a short while you will hear the transmitter drop or the signal rest, followed by a new message. Each message starts with a period of reversals (binary 0101010...) and then a sync sequence followed by the message and ending again on reversals. If you view this on a normal Baudot RTTY decoder, the reversals are printed as RYRYRYRY... and the sync sequence as VMGTCNJB.

While 75bd/850Hz shift signals are the most commonly heard "gibberish" culprits, there are also 50bd signals with the same shift operated by the French Navy. Rarely you'll also hear 100bd and 150bd versions of this encrypted signal, too.

As the signal classifier in the Hoka decoder software says on detecting the signature of these systems "Log it and move on." Wise words indeed.

❖ Iraqi Forces ALE Net

An Iraqi Army ALE network has occasionally made its way across the Pond in the summer months. Here are the stations and frequencies involved:

5267, 5422.9, 5748.5, 6845, 6852, 6918, 7824.6, 7944.9, 10378, 10541, 10596 kHz
USB

10V 10th Division, Basrah

11V 11th Division, East Baghdad

14V 14th Division, An Nasiriyah/Basrah

17V 17th Division

1DV 1st Division, Fallujah

2DV 2nd Division Mosul

3DV 3rd Division, Al Kasik

4DV 4th Division, Tikrit

5DV 5th Division, Balad

6DV 6th Division, Baghdad

7DV 7th Division, West Anbar Province

8DV 8th Division, Ad Diwaniyah

9DV 9th Division, Taji

10DV 10th Division, Basrah

BAG Collective call, Baghdad

IGF HQ, Baghdad

IGF1 HQ, Baghdad

MOD, MODNET Ministry of Defense HQ, Baghdad

NAY1 Navy Base, Umm Qasr, Basrah

❖ Austrian Army Net

The Austrian Army contributes a force to the UN peacekeeping contingent in the Golan Heights of Syria. There are daily linkups using

ALE between the outpost and the HQ in Vienna.

Check the following

frequencies:

5435.5, 5838.5,
6990.5, 7594.5,
8019.5, 10156.5,
10873.5, 11418.5,
14401.5, 14438.5,
14609.5, 16116.5,
16252.5, 17451.5,
18554.5, 20318.5 kHz
USB

The following callsigns/identifiers are used:

OYE41

OYE51 HQ Vienna

OYE52

OYE611 Vienna

OYE621 Salzburg

OYE652 Vogler Airbase

OYE71 Austrian Forces, Golan Heights, Syria

❖ New GLN Node

A new Global Link Network (GLN) node has now started transmissions from South Africa from its affiliate Melville Radio and can be heard well in the US on some frequencies.

The station uses callsign ZRK696 and transmits using PacTOR on the following frequencies:

4262.5, 8251.5, 12257.5, 16371.5, 22753.5 kHz

Melville adds to the stations already active in Kiel (Germany), Buenos Aires (Argentina), Wankmail (Australia), Bern (Switzerland), Manila (Philippines), Rogaland (Norway) and Seattle and St Augustine (US).

❖ New XNet Node

GLN competitor in the "internet email at sea" segment XNet, has also continued to build out its network adding stations under callsign WQDT278 in locations:

Lakeland, FL
Maryville, TN
Smithfield, VA
Asheboro, NC
Guaynabo, PR

Frequencies to listen out for the 100bd/200Hz PacTOR "channel free" signal and CW identification "XNET" include:

4569, 5179, 5728.6, 5787, 8033.6, 8043.6, 9113.6, 10563.6, 12188.6, 13975.6 kHz

That's it for this month. Until next time, enjoy the digital utilities.



Radio Netherlands Cancels SW to NA

It came as a shock in mid-September when Radio Netherlands announced that it would cancel English broadcasts to North America on shortwave at the end of the A-08 season. The final hours via Bonaire should be October 25 (or UT October 26) at 0000 and 0100 on 9845, 0400 on 6165.

RNW had concluded that there is no longer enough of a SW audience here to justify the expense of three transmitter-hours per day. They will remain in use, but for Spanish to Latin America instead. Broadcasts in Dutch will continue for the time being, but are also being reviewed.

Justifying this, RNW presented a long list of "partner stations" carrying its programming in the USA, but most of these involve music shows, *Performance Today* and *Symphonycast*, which draw only a fraction of their content from RNW, and such programming had already

been dropped from shortwave many years before.

Target areas for RNW English shrink further to Africa and Asia only where SW is still considered to be viable. Of course, we SWLs in North America can still pull them in with some effort, but no longer will they be an easy-listen each and every evening. In the B-08 schedule, our best chance is at 2000-2100 UT on 17810 via Bonaire, or 11655 via Madagascar; perhaps also at 1400-1600 on 15595 Madagascar.

Or, give up and listen via Internet. RNW had earlier launched a weekly podcast on the US presidential election, not on SW, "Europe Goes to the White House."

Many listeners reacted as if this was the nail in the coffin of international shortwave broadcasting, as RNW had held out longer than BBC, Deutsche Welle and several others in canceling SW to North America in recent years.

ABKHAZIA The Russian invasion of Georgia in August spurred renewed interest in the only SW station in Abkhazia. It relays R. Rossii part of the time, its own programs at other times. There are two transmitters, each slightly off 9495 kHz. But there is no SW in South Ossetia (gh) 9494.76, 0415-0505 fade out, Abkhaz State R., Soxum, Georgia, R. Rossii relay with news read by man and woman, folksongs. Ten days later at same time had Abkhaz talk and songs (Anker Petersen, Denmark, @*atividade DX*) On exactly same frequency at 1400 with ID "Apsua Radio" and "Radio Respublika Abkhazia" (Patrick Robic, Austria, A-DX via BC-DX) Another day at 0400-0515 on 9495.55 instead, but at 1530-1600 on 9495.75 (Wolfgang Büschel, *DX LISTENING DIGEST*) Unfortunately, 9495 is blocked in NAM at many hours by WYFR or WHRI (gh)

Don Jensen, NASWA reports he was able to get an e-QSL by having Google translate his report into Russian, and lacking an address for the station, sending it to some nearby buildings in Sukhumi. Someone passed on his report and they replied from *apsuaradio1@mail.ru* (gh) Rumen Pankov, Bulgaria, also got a reply from the station that they planned to start an info block in English (BC-DX)

ARGENTINA In mid-August at 1948, we noticed RAE's transmitter on 15344.8 was not only off-frequency, but unstable, jumping slightly between two different frequencies. That must have been the last straw (gh) RAE is off SW since Aug 25, still webcasting. A problem with tubes; two have been obtained and two more are awaited (Gabriel Iván Barrera, Argentina, *DSWCI DX Window*, et al.) In late August at 2353, heard on 5940 or 5945, IDs for RAE along with R. Nacional Argentina, closing Spanish broadcast; test or feeder? (Ing. Santiago San Gil González, Venezuela, *DXLD*) But no later reports of that. RAE supposedly has three transmitters, so maybe one of them semi-functional. Check for return to 11710w with English during DST at 0100-0200 UT Tue-Sat (gh)

AUSTRALIA No sign of 2368.5 (Walt Salmaniw, QCI, BC, IRCA) Radio Symban is moving to a bigger studio and premises with a new bigger and better SW antenna. We expect to be back on air in the next 8 to 12 weeks [Oct-Nov]. (Angelo, Manager *symban@radiosymban.com.au* NZ *DX Times*) No longer licensed at Gosford NSW, new location Marrickville (Richard Jary, Australia, *ARDXC*)

BANGLADESH R. Bangladesh, 4750, good over co-channel Indonesia, China at 1257-1410+ in late August, 1300 Bangladesh Betar ID (Walt Salmaniw, Haida Gwaii, BC, *DXLD*) Shocked to hear the usual IS at 2359 on 4750. Very weak amid QRM but definitely there, actually a poor subcontinental evening in late Aug (Dave Valko, PA, *Cumbre DX*)

BHUTAN BBS, 6035, final hour in English until 1501* on a Wednesday was a call-in, mostly talk, some music, best after 1430 (Ron Howard, CA, *DXLD*) Also heard same date, mostly young people, dating advice (Walt Salmaniw, Masset, BC, *ibid.*) Same here, armchair levels on mostly clear channel. But starting the next day, lost audio at 1415 while carrier stayed on until 1500 (Jari Savolainen, Finland, *ibid.*) This continued to happen for the following week (Ron Howard, CA, *ibid.*)

BOLIVIA New unID station heard Sept 13 at 1050-1105 on 6075, reports about Bolivia (Arnaldo Slaen, Argentina, *DXLD*) Also heard at 1030-1200, mentions Red Patria Nueva, the 6025 station (Rafael Rodríguez R., Colombia, *condiglist* ya via

DXLD) Also next day at 1000, pro-Evo Morales, pro-coca (Lúcio Otávio Bobrowiec, Brasil, *DXLD*) Recorded here around 1030, another day from 0900 (Chuck Bolland, FL, *ibid.*) Talks about fascistas, frequencies 740 AM, 6075 OC, both new, unlisted in WRTH (gh) Also heard from 0200 to closing around 0230 (Rodríguez, *playdx* yg)

It's Radio Causachun Coca, which means "long live coca", a phrase attributed to Pres. Morales! (Henrik Klemetz, Sweden, *DXLD*) Part of the new Sistema de Radios de los Pueblos Originarios, some 50 stations around the country, but now on SW. Apparently operates from a place called Lauka N, Provincia de Tiraque, Región Trópico, Depto. de Cochabamba; also relays RPN for a sesquihour in the morning, according to www.comunicadoresindigenas.org (Dario Monfeirni, *playdx*)

For less than a week in early Sept, R. Virgen de Remedios, Tupiza, was on 4555, then back to 4111; usually heard around 2250, and as late as 0019, masses and other Catholic programming (Lúcio Otávio Bobrowiec, Brasil, *WORLD OF RADIO*)

BRAZIL R. Nove de Julho had been authorized on 9820 for many months, and reports it was about to activate proved false, but it finally appeared in early Sept (gh) First heard Sept 12 at 1600-2000 on 9820 (Edison Bocorny, Jr., RS, *radioescutas* yg) Also at 1345-1405, religious programs (Arnaldo Slaen, Aegentina, *DXLD*) Weak signal audible after Cuba closed at 0000 until VOA opened at 0130, peaking around 0100, but cannot ID for sure (Don Jensen, WI, NASWA) Catholic programming, phone-in at 0324 (Marcelo Vilela Bedene, *dxclubes Paraná*) Named for the July 9, 1932 revolt against dictator Getúlio Vargas (Samuel Cássio Martins, SP, Brasil, *DXLD*) And was closed down in the 1970s by the military dictatorship then (Célio Romais blog)

Rádio Cultura de São Paulo, nominal 9615, but out of order jumping all over the 31m band, landed on 9410 August 23, strong but distorted (Jorge Freitas, Bahia, *dxclubes pr*)

CANADA CFRX, 6070, relaying CFRB, heard at 2050 Sept 4. I can hardly believe they are back on! (Steve Lare, MI, *DXLD*)

Had been off almost two years for repairs. I discovered it too at 2315 with a "Newstalk 10-10, CFRB" ID immediately, plus an unfamiliar het since CFRX was off-frequency, about 6069.8. Just as I expected, this gets worse and worse as the evening progresses, as 100 kW CVC Chile is on 6070.0 from 2300 to 1300 (B-season reduced to 0000-1200) until 1 kW CFRX loses out completely.

After almost a week, CFRX adjusted much closer to 6070 but still with a SAH, and then modulation level dropped to almost nothing. If that can be repaired, CFRX should be in the clear during most of the daytime in eastern NAM. But it would still be better to find a less occupied frequency, e.g. in the 5700-5800 range, as there are roughly 13 other stations around the world using 6070 at some time during the day or night, winter or summer; but the easiest solution would be for CVC to shift to 6065, which it is certainly flexible enough to do.

Present format is personality-driven, so if you don't know the talk hosts, their names mean nothing. Brace yourself for frequent interruptions by traffic reports and lots of commercials. However, there are several specialty shows on weekends, about home improvement, movies, cars, trivia, college student documentaries, comedy; see www.cfrb.com/

*All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; sesqui = one and a half; B-08=fall/winter season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated*

shows

CFRX has a new QSL, but I have the old one, in fact the very first SW station I verified back in 1957: www.worldofradio.com/QSL.html (gh)

CUBA The hurricanes through Cuba in August and September resulted in some brief interruptions in jamming, but they were soon back in force against R. Martí, VOA, WRMI, R. República and anyone else who happened to get in the way. There were also numerous operational errors by RHC – bad or missing modulation, wrong language on wrong frequency, Venezuela relays displacing RHC, two programs at once, erroneous frequency announcements and incorrect schedule on website. We logged this in detail in DXLD, and would take more than the rest of this column to report it all. Every day something different went wrong, and this was whether or not there were hurricanes. We have never witnessed any other international SW station with so many problems. The jamming included WRMI 9955 while WORLD OF RADIO was on, even though Arnie Coro's DX program goes on the air unblocked by any such jamming (gh)

EGYPT R. Cairo English, B-08 tentatively: 1215-1330 17835, 1600-1800 12170, 1900-2030 9310, 2115-2245 6255, 2300-2430 6850, 0200-0330 7535 (gh)

EQUATORIAL GUINEA R. Africa, with NAM preachers in English, resumed 15190 on August 13 at 1515, and was then widely reported almost every day for a month, as late as 2250, the final hour colliding with WYFR (gh) From 2200 daily carried the Tony Alamo ministry (Ron Howard, CA, DXLD) Whose compound near Fouke, Arkansas was raided in mid-September on suspicion of child porn and sexual abuse (AP) Alamo website is anti-Catholic, also shows other SW stations carrying him (via Brock Whaley, DXLD)

GERMANY [non] DW Russian service, 15420 via UK, puts surprisingly good signal into CNAm, such as Sat 1430-1500 with avant-garde music show called Muzprosvet. DW page on show says it is hosted by Andrew Gorokhov (gh) Muzprosvet means music enlightenment. Enjoy it while you can, as DW has announced a "major program reform" (Sergei S., IL, DXLD) If it still exists in B-08, look for it at 1530 on 11720 and 15620 (gh)

HONDURAS HRMI, 3340, sporadically active, at 0610 with OM preacher in English plus consecutive translation into Spanish by YL. Also another morning at 1123, when R. Luz y Vida, 3250, was doing the same thing by a different competing pair, except this YL had a heavy gringo accent. (gh)

INDIA AIR Imphal was back on air, 4775 some days in mid-Sept, at 1328, 1404, 1437 (Ron Howard, CA, DXLD) Strong carrier but weak modulation until 1700* (Jari Savolainen, Finland, *ibid.*)

INDONESIA During Ramadan, RRI Fak2, 4790 was heard frequently with Qur'an at various times between 1230 and 1330, unlike the other RRI 60m outlets; more Islamic than the rest? Except Sept 17 at 1310, when they were // with a public speech, sermon? Also on 4750, 3995, 9680 (gh, OK)

New name for Kang Guru Radio English, KGRE: On Aug 25, Kevin Dalton ("Kapt. Kang Guru") posted to his website forum that KGRE has now become "Kang Guru Indonesia" (KGI). Per Dan Sheedy's reception, now with this new ID, via RRI Jakarta, 9680, Wed. & Fri. 0800-0820 (Ron Howard, CA, DXLD)

Much better than Google for translating reception reports into Indonesian is www.toggletext.com (Don Jensen, WI, NASWA yg) And the replies back into English (gh)

INTERNATIONAL WATERS [and non] Abie Nathan, the pilot, entrepreneur, peace activist and founder of the groundbreaking "Voice of Peace" radio station on a ship, died Aug 27 at Tel Aviv's Ichilov hospital. He was 81. One obit is at www.iht.com/articles/ap/2008/08/27/africa/ME-Israel-Obit-Nathan.php (via Mike Barraclough, UK, DXLD) VOP was on SW 6240 around 1983-1984. A QSL shows power as 400 watts (Artie Bigley, OH, *ibid.*)

ISRAEL REKA website redesigned, and now has on-demand links, directly to the four (remaining) weekly English radio programs aired during the English news (without the news surrounding the show) – Weekend Report, Sunday Edition, Culture Report and Face to Face. Via www.iba.org.il/reka/ (Doni Rosenzweig, DXLD)

KOREA NORTH [non] Shiokaze's 1400-1430 broadcast was on 6015 for a while to avoid jamming, then returned to 6020; alternates Korean, Japanese and English from day to day (via Ron Howard, CA) On a Friday when in English, included a new segment in French at 1422-1425 (Walt Salmaniw, BC, and Ron Howard, DXLD) They say that French people were also abducted (Salmaniw, *ibid.*) The April 21, 2008 issue of *Le Figaro*, Paris, had a story about this (Howard, *ibid.*)

KURDISTAN R. Voice of Kurdistan, northern Iraq, at 0223-0320 on 3928.35, martial song, jammed by Iran and jumped at 0230 to 3934.04; at 0320 was on 3937.50 and no jamming. Another clandestine:

V. of Iranian Kurdistan, from Al-Sulaymaniyah, Iraq, at 0250-0330 on 4864.72, jammed by Iran (Anker Petersen, Denmark, *playdx* yg)

LAOS I can receive Lao National Radio at 4412.6 kHz since the beginning of August, audio file linked ([peace J] near Tokyo, Japan. www.peace-j.net/ WORLD OF RADIO)

Thanks for a great tip! Sounds like it to me; I suppose the time was 1159 UT, with the bells on the hour. They overlap so much it's hard to count them. A regional? There's an ID at the end of the clip "Thini --" but if they mention a non-Vientiane city, can't catch it. The only active

regional in WRTH 2008 is Sam Neua, 4678v, so maybe that has moved (gh, *ibid.*)

4412.62, Lao National Radio, 1157-1231*, Glenn is probably correct that this is new frequency for Sam Neua, Houa Phan Province. Clearly not parallel to 6130 till just before the top of hour, so assume was their own regional programming. They are varying in frequency, which I believe is also consistent for Sam Neua. Next day heard on 4412.60, at 1205 with poor reception and still // 6130. And another day on 4412.58v at 1257-1231* (Ron Howard, CA, DXLD)

LIBERIA 6070, ELWA, Monrovia, 2235-2302*, gospel music, closing announcements and national anthem at 2300, fair level. No sign CFRX. Co-channel QRM at 2300 from Chile-CVC. Thanks to Bob Hill for tips (Brian Alexander, PA, DXLD) 0530-0800, 1730-2300 with 1 kW (Anker Petersen, DSWCI DX Window)

MADAGASCAR 5010, R. Nasionaly Malagasy, Ambohidrano, 1334-1423, Aug 13, in French or a similar sounding vernacular, playing Hi-life music/singing and calypso type songs, started out with light AIR QRM, but gradually dropped out. Recently only found India here, so this was a nice surprise (Ron Howard, CA, DXLD) Very nice longpath catch. Madagascar is the closest SW country to the antipodes from western North America (gh) Also another day at 1340-1356 with non-stop ballads in French, no LSB, only in USB and AM (Ron Howard, *ibid.*)

Please check the other listed Madagascar frequencies at this time (Thorsten Hallmann, Germany, *ibid.*) 5010 audible as late as 1507, and // weak 6134.93, under WYFR via Russia until 1500. 7105 blocked by Fire Drake; 7155 something under VOA but not // 5010; 9690 only with India (Ron Howard, CA, WORLD OF RADIO)

MAURITANIA R. Mauritania reactivated August 18 at 1902 on 4845; had been off from a few days before the coup (Antonio Madrid, Moraleda, Spain, *logsderadio* yg) Also at 2310-2430 in Arabic/French, after absence nearly a month (Anker Petersen, Denmark, @*tividade* DX) Was not 24h for Ramadan in September, but heard after 0600 with soporific chanting, putting me and the faithful to sleep... (gh)

MÉXICO UNLD on 6185 a Thursday at 1002 in Spanish, repeating a loop announcement about a free political program called something ending in -dad, low modulation. XEPPM SW schedule ends at 0500 (Harry Helms, TX, DXLD) Really runs until 1100 on 6185 (1200 in winter), but simulcasts MW after 0500. On XEEP 1060 schedule we find on Wed and Thu only at 1000-1200: *Del Campo y de la Ciudad*, so I think that's what you had; I later heard it on Sept 11 about anniversary of assassination of Salvador Allende, cut off at 1100 referring listeners to MW and stream for rest of show.

R. Educación also made a rare daytime appearance on 6185, Sept 10 at 1411-1500+ about the conference it was sponsoring, *La 7a. Bienal Internacional de Radio*. (There were also unsuccessful DRM tests from French Guiana for demonstrations at the *Bienal*.) No QRM on 6185 at this hour, but when it normally signs on at 2300, collides with Brasília, which should please move back to 6180. XEPPM opens with national anthem and introduction in English as well as Spanish, but most programming is really in Spanish. However there is a show title in English, *On the Road*, UT Tue/Thu/Sat 0015-0045. After DST, one hour later, and opens at *0000 (gh)

NETHERLANDS On October 27, 2007, Radio Netherlands stopped using transmitters in Flevo owned by KPN Broadcast. The last few months KPN is in the process of dismantling the four 500 kW AEG transmitters in Flevo. The future for the transmitter building and antennas is not known. All the transmitter parts will be used as spares for a German shortwave station (perhaps Nauen, Jülich or Wertachtal). Pictures can be seen at www.omroepzendermuseum.nl/ (Jan Oosterveen, Netherlands, DXLD) The same Telefunken equipment as Media Broadcast runs in Germany itself. Perhaps they will even be reassembled and set up at the Wertachtal to replace four of the remaining old, plate-modulated transmitters from 30+ years ago? (Kai Ludwig, Germany, *ibid.*)

PALAU Cf. last month. WHRI on 9955, August 4 at 1035 (Dennis Allen, NSW, Australian DX News) WHRI would not possibly be on 9955 during the 24 hours that WRMI just south of there uses it. Must have been another test of WHR via KHBV/T8BZ PALAU (gh) Their mailbag program *Harvest*, really heard on WHRI 7365 at 0500 mentioned a listener hearing them via Palau (Christer Brunström, Sweden, SW *Bulletin*) But 9955 open when rechecked Aug 24 at 1334 (Luca Botto Fiora, Italy, *playdx* yg)

LeSEA began broadcasting the gospel into China from a shortwave radio station, located on Palau near Koror. Through the miracle of high-powered international shortwave radio, the Good News was preached, verified and received in China. Please pray for the \$600,000 needed to pay off the note on the station and free up resources for operation and equipment expenses will be met (WHR Newsletter via Liz Cameron, MI, DXLD) Why wouldn't KWHR reach into China? According to their own website www.whr.org/Technical-Information.cfm it does. This all seems redundant to me (Cameron, *ibid.*)

VTC was testing 9945 between 1428 and 1530 in mid-Sept, including Merlin music and KWHR IDs, presumed via T8WH in Palau (Hiroshi via S. Hasegawa, NDXC, DXLD) So the purchase progresses, already changing callsign from T8BZ to reflect World Harvest; KWHR IDs explained by using same satellite feed from South Bend to KWHR. Democratic V. of Burma clandestine also reported testing via VTC, Palau at 13-14 on 12095, but unconfirmed (gh)

PAPUA NEW GUINEA Several new SW religious stations are planned, but whether these will use DRM to feed low powered FM networks isn't at all clear (David Ricquish, NZ, DXLD)

SAINT HELENA Radio St. Helena Day 2008 will be on 11092.5-USB, Saturday, 15 November 2008: 2000-2100 to Japan, 2100-2230 Europe, 2230-2330 North America. QSL address is: Radio St. Helena, P. O. Box 93, Jamestown, St. Helena, STHL 1ZZ, South Atlantic Ocean. Wishing everyone excellent listening conditions (Laura Lawrence, Station Manager, Radio St. Helena, via Robert Kipp via Mark Nicholls, NZ DX Times) However, Miss Lawrence resigned as manager 5 September to pursue a career in teaching. The new Acting-Station-Manager of RSH is Mr. Gary Walters. His email address is radio.sthelenahelanta.sh (Robert Kipp, via Anker Petersen, DXLD)

SLOVAKIA Pete Miller and Katarina Korcek were missing from the R. Slovakia International "Listener Tribune" program on Sunday September 7. Listeners were introduced to the new team. Pete and Katarina were both on the program the week before as usual. No mention of their replacement or it being their final program (Kraig, KG4LAC, Krist, VA, DXLD)

Our colleague's name is Maria Bulkova and she will have her contact details posted on our website shortly. Will Martin is our contributor. All we can do is hope that you will stay our faithful listener and keep on being interested in learning more about Slovakia (Dragu Anca, RSI, via Erik Kæie, Denmark, DXLD)

On the next program, RSI's Chief Editor gave his response: "Working in our organization involves situations which please no one, but nevertheless which need to be solved, even if they entail unpopular measures. In this case it primarily comes down to finance as we have been forced to reduce our cooperation with external contributors. And not just in the English Section of RSI. I'm convinced that my colleagues who took over from Pete are preparing no less interesting programs and that *Listener's Tribune* will continue to be your favourite program. Thank you." (Jon Pukila, Ont., DXLD)

This is a shame. Both Pete and Katarina made for enjoyable listening. They gave RSI a personal and a human feeling. Now, the RSI team sounds impersonal, unemotional and robotic. I miss Pete's and Katarina's delivery and interaction with the listeners. Shame if they are gone: (Pete and Katarina, take care. Wishing them the best in their new endeavors. Hope to have the pleasure of hearing them both again (Kraig Krist, ibid.)

SPAIN Tidbits from *Amigos de la Onda Corta*: as of mid-Sept, plans were for REE to continue on SW, while adding new platforms. A name change for the program is coming, removing the offensive "shortwave" and listener suggestions were being received (gh) Also announced that after three years, REE had resumed QSLing (José Bueno, Spain, *Conexión Digital*)

SUDAN [non] Via Meyerton, South Africa, 15390, Southern Sudan Interactive Radio Instruction, *1300-1330*, music and into English language lesson with frequent doorbell cues, drums. Similar programming, but not parallel, on 15760 at *1302-1325*. Both weak but 15760 slightly stronger. Mon, Wed, Fri only. Thanks to Glenn Hauser for tip (Brian Alexander, PA, DXLD)

SWITZERLAND Bob Thomann turned 80 on September 24th. To commemorate the event, *Switzerland in Sound* features an interview with him, under "The Two Bobs" section

🔊 www.switzerlandinsound.com (Bob Zanotti, DXLD)

SYRIA Spanish department of R. Damascus e-mailed a plaintive plea for listener response, in order to justify to the powers that be, continuing to broadcast in Spanish, 2215-2330 on 9330, occasionally 12085, 13610 (via José Bueno, Spain, DXLD) It would help if they added some modulation to their carrier, and ran anywhere near the nominal power of 500 kW. The program people don't understand what the real problem is (gh) I've only been able to hear it a couple times in four years (Álvaro López Osuna, Granada, Spain, *noticiasdx* yg via DXLD) I could hear it at 2200-2300, best reception at sign-off (José Elías Díaz Gómez, Venezuela, DXLD)

TURKEY [and non] Another Firedrake channel soon? TRT opens a new Uighur service at 0100-0200 UT on 6000 kHz in B08 season. The Chinese will be happy to jam another Muslim service to East Turkestan (Wolfgang Büschel, BCDX)

U K BBC has been covering the US election; details at <http://bbc.com/uselection> Includes on-site reporting and photos from the US08 Election bus plus an interactive and customizable widget, links to a BBC poll tracker, battleground map, Q&A Presidential Election and issues guide.

BBC Debate: *Talking America* – the BBC joins partner stations, universities, community groups and individuals to co-host a series of exclusive, thought-provoking debates. The final one from Minneapolis is transmitted live on 1 November at 1700 GMT (BBC Press release)

[non] BBCWS, 11860 via Guiana French, Aug 19 at 1156 with totally inappropriate ID loop in English, about "no service on this channel, but 24h English and Arabic on one of this satellite's nearby channels" (paraphrased) and referring to bbcworldservice.com But, but, this is shortwave, not satellite! At 1200 cut to BBC Mundo Radio in Spanish, and thence heavy adjacent channel interference from CRI 11855 via Sackville (gh)

U S A World Public Opinion survey director Steven Kull said, "the United

States is not in a strong position to tell its story. The American narrative is not as powerful in the world today."

Really? Could that possibly have anything to do with the fact that the Broadcasting Board of Governors has turned off 55% of the VOA transmitters, sharply reduced broadcast hours for English and other widely-spoken languages and slated the Russian, Georgian, Ukrainian, Bosnian, Macedonian, Serbian, and Hindi radio services for closure in September alone?

How can that be? Congress directed the BBG not to shut down any more radio services and provided funds to keep them going. Yet, in direct disregard of explicit instructions of the Congress of the United States, the BBG has done precisely the opposite. Before America's voice is further hushed, Congress' voice needs to be heard (Neil Currie, Senior News Anchor, VOA "Worldwide" English, DXLD)

Voice of America's Hindi radio service was to cease on September 30, 2008 (it was first launched in July 1955). Ashok Sarin of VOA Hindi Service (Radio) asked those interested to write to members of Congress who might be able to influence this decision. See www.sajforum.org/2008/08/voa-hindi-servi.html?cid=127425910 (via Alokesh Gupta, India, DXLD)

Cf. last month. Later in August, VOA added another hour of Georgian at 1700-1800 on 7420, 11955 (Dragan Lekic, Serbia, *WORLD OF RADIO*)

VOA added extra SW transmissions to cover live the Democratic and Republican conventions in August and September. This is because VOA normally is not broadcasting much in English at prime-time 0100 UT. But the special schedules were not published, only announced at other times, e.g. on the African service at 0628, saying the Republican coverage would be at 0100-0300 on 6080, 15580. 6080, which normally opens at 0300, had been heard before then live from Denver by Chuck Bolland, FL, DXLD. Perhaps the same will happen for election returns early UT November 5. Meanwhile, VOA has a special website www.usavotes2008.com/ but is there anything about shortwave on it? Not that I can find. However, I learned somehow that 6080 and 15580 were via São Tomé, and 9885, 12080 were on from Botswana (gh)

Another campaign: to dissuade IBB from destroying the Delano SW facility, which was closed a year ago, just in case SW is ever needed again: www.radiationall.org (Ed Insinger, NJ, DXLD)

I appreciate the fact that re-launched WRNO opens its broadcasts at 0100 on 7505 with world news bulletin. It's a great public service that hopefully will continue (Sergei S., IL, DXLD)

From what source? They credit BBC news at the end, but always begin with a religious-angle story; hard to believe BBC would lead like that. A much greater public service would be to relay real BBCWS news on SW in NAm (gh) I wonder if the BBC knows about this? Not sure they would be too keen on BBC news being used in this way – especially if items are being re-edited and then attributed to the BBC (Dave Kenny, UK, DXLD)

As to RF interference complaints from the neighborhood, so far there have been none. RF is at the full 50 kW licensed output and modulation is clean. The transmitter runs cool with current readings at the low end of their maximum ratings. The daytime frequency 15590 has not been on the air long enough (only testing at this point), to determine how it will get along with the neighborhood but testing results were good (Larry Thom, Chief Engineer WRNO, *radio-info.com* forum via Richard Lewis, MS, *WORLD OF RADIO*)

WRNO vanished again the night before Hurricane Gustav, and did not come back for 10 days, off as a precaution? Bruce Barker got a tip from WRNO by e-mail that they were about to return, which also said they had been down for power loss, not because of any damage to antenna or tower (gh)

Besides UT Sundays 0300 on WBCQ 7415, QSO with Ted Randall added WRMI, 9955, Sundays at 1800-2000, which could be heard if Cuban jammers relented. If these are still on in Nov, times would be one UT hour later after DST (gh)

In August, WBCQ reduced its airtime on 7415 to save costs during unsold time. *Off the Hook* was off the schedule, and *WORLD OF RADIO* gone from 0415 UT Mondays – but added Mondays at 2200. At least during Sept, Area 51 expanded to 7 days a week at 2300-0100 on 5110, including *WORLD OF RADIO* Fridays at 2300, followed by *International Radio Report* and, // 7415, *Allan Weiner Worldwide*. Other WOR broadcasts remained, Wed 2100 on 15420, Thu 2330 on 7415. If still in effect, these times shift one UT hour later after DST in Nov, as should those on WWCR, WRMI (gh)

"It's tough! It's going to be very hard for WBCQ this winter. In November the local power company goes to what is known as 'winter rates' with a bogus fuel service surcharge that is linked to the price of fuel... [Listeners'] donations will be very much welcome. We are in the red, bills are piling up," says Allan Weiner, Worldwide. But Allan doesn't want donations from people who live on a limited budget and cannot afford sending money to others. Also, free broadcasters who cannot afford buying airtime are welcome to apply to be included in a daily Area 51 programming bloc 2300-0100 UT on 5110. On September 8, 2008, WBCQ was 10 years old (Sergei S., IL, DXLD)

Until the next, best of DX and 73 de Glenn!

BROADCAST LOGS

NOTEWORTHY LOGS FROM OUR READERS

Gayle Van Horn, W4GVH

gaylevanhorn@monitoringtimes.com
http://mt-shortwave.blogspot.com

0015 UTC on 9440

CZECH REP: Radio Prague. Czech's Today program with focus on woman cellist. SIO 554 // 7345 (Bob Fraser, Belfast, ME). 7345, 0315-0320 Joe Wood, Greenback, TN).

☞ Streaming/on-demand audio www.radio.cz/en/

0112 UTC on 4052.50

GUATEMALA: Radio Verdad. Lady announcer's Spanish comments to religious music and scripture text. Considerable background noise in the studio until return of music at 0124 for good signal quality (Chuck Bolland, Clewiston, FL).

☞ Streaming audio www.radioverdad.org/

0115 UTC on 9665

RUSSIA: Voice of Russia. *Russia and the World*. SIO 554 // 7250 (Fraser). VOR 13635, 0443-0450. SINPO 44333 (Jim Evans, Germantown, TN). VOR 9435, 0420 via Petropavlovsk (Stewart MacKenzie, Huntington Beach, CA). **Radio Rossii** 5920, 1008-1030. Russian comments to canned identification, followed by extended commentary. Observed partial ID audible as "...Rossii..." by announcer. Recheck at 1047 as station covered by WBOH Spanish (Bolland).

☞ VOR streaming audio www.vor.ru/world.html

0240 UTC on 7475

GREECE: Voice of Greece. Greek conversations and program features to Greek music program // 9420 (SIO 323) (MacKenzie). VOG 9420, 2350 for Greek vocals and announcer's English ID. SIO 554 (Fraser).

☞ Streaming audio www.voiceofgreece.gr/

0300 UTC on 4780

DJIBOUTI: Radio Djibouti. Sign-on with national anthem to Arabic announcement. Short breaks of Middle Eastern style music and Koran recitations. Arabic conversations amid poor-fair signal quality with CODAR interference (Brian Alexander, PA)

☞ On-demand audio www.rtd.dj

0326 UTC on 7440

UKRAINE: Radio Ukraine International. Station ID and item on the 11th century geography of the Ukraine, and how it has changed. Segment on the German occupation during WW II in 1941. Signal crystal clear at armchair level (Wood; MacKenzie).

☞ Streaming audio www.nrcu.gov.ua/

343 UTC on 6185

MEXICO: Radio Educacion. Spanish station promotional to announcer's text. SIO 333. (MacKenzie)

☞ Streaming/on-demand audio www.radioeducacion.edu.mx

Additional stations in Spanish; Mexico's **Radio Mil** 6010, 1032, station jingles to commercials. Signal fair at best. **XERTA** 4800, 0623-0637 (Scott Barbour, Intervale, NH). Radio Mil audible 1144-1201 (John Wilkins, Wheat Ridge, CO).

☞ Radio Mil streaming audio www.radiomil.com.mx/

0430 UTC on 15195

JAPAN: Radio Japan (Yamata). Piano music program to occasional Japanese comments. Moderate signal with fading. (SINPO 34323). Parallels on 15325 and 5960 via Sackville, Canada (Evans).

☞ Streaming/on-demand and podcast www.nhk.or.jp/nhkworld/index.html

0531 UTC on 5030

BURKINA FASO: Radio Burkina. Station sign-on with national anthem to French announcement and ID. Local African music program of poor-fair signal quality; 5030, 2340-0003* (Alexander). 5030, 0623-0639 (Barbour). 2256-2311 high-life music, ID and presumed radio drama (Barbour).

0556 UTC on 5995

MALI: RTVM. Guitar interval signal to national anthem at 0558. Flute interval signal at 0559 and opening French identification. Announcer's intro into Koran at 0603. Signal weak with Radio Havana signal splatter on 6000 (Alexander).

1055 UTC on 3325

INDONESIA: RRI-Palangkaraya. Indonesian music to station ID Local interval signal at 1059 to time pips signal. Regional news to musical bridge at 1105 and announcer's Indonesian talk (Wilkins). **RRI-Jakarta** 9680, 1042-1050 (Indonesian). **Voice of Indonesia** 11784.87, 1057-1105. Weak signal amid announcer's station website URL to news on the hour. Very poor signal (Bolland). VOI 11784.87, 1005-1019 (Ron Howard, Asilomar Beach, CA). **RRI-Wamena** (tentative) 4869.93, 1236-1301 (Wilkins). RRI-Pontianak

3976, 1342-1353 // 3325 Palangkaraya (Howard). VOI website www.rri-online.com/

1212 UTC on 3385

PAPUA NEW GUINEA: Radio East New Britain. English script for newscast, followed by program commercials including one for automobiles. Talk segment in Pidgin to 1229, followed by selections of soul music. Good signal. PNG's **Radio New Ireland** 3905, 1139-1210. Slow style English text to interludes of island music to 1200. Five minutes of dead air up to 1205 music program. Fair signal despite amateur radio operators at 1210 (Wilkins). **Radio West Sepik** 3204.97, 1231-1245 (Wilkins).

1230 UTC on 6035

BHUTAN: BBS. Presumed this station with flute melody and regional music vocals. Announcer in unid language between music segments, closing with chanting from 1255-1258. Fair signal quality but lost by 1259 from co-channel BBC at 1259 and Firecracker on 6030 at 1300 (Wilkins). BBS 6035, 1401-1501.* Beginning with, "here is the news from the Bhutan Broadcasting Service, to public-service announcements and phone-in program. Indigenous music to sign-off, after 1430 reception quality was best (Howard).

☞ On-demand audio www.bbs.com.bt/

1235 UTC on 15240

SWEDEN: Radio Sweden. Report on the biker gangs being considered the new Mafia. SIO 554 (Fraser). 6065, 2155-2200.* Closing bits of English service to station ID and music (Bolland).

☞ On-demand audio www.sr.se/rs/english/

1250 UTC on 15450

TURKEY: Voice of Turkey. *Diplomacy Agenda* program on fighting terrorism. SIO 453 (Fraser). 7325, 0320-0326 (Wood).

1425 UTC on 6134.92

MADAGASCAR: Radio Nasionaly Malagasy. French programming, best in LSB due to WYFR splatter; Audible on // 5010, both freqs weak (Howard). **Radio Voice of the People** via Madagascar relay 9895, 0420-0455.* Local Afro music to vernacular text to ID. English news at 0443 on local violence. Closing announcements at 0454. Poor signal (Alexander)

1605 UTC on 9515

CANADA: Radio Canada International. News on a propane gas explosion in Toronto. SIO 353 **Radio Japan Canada relay** 6120, 1200 (SIO 555). South Korea's **KBS Canadian relay** 7650, 1230 (Fraser). **CFVP** Calgary 6030, 1250-1303; **CKZU** Vancouver 6160, 1305-1335 (Wilkins). **CKZN** Newfoundland 6160, 0850-0900 (Bolland).

☞ Streaming audio www.rciviva.ca/rci/en/

1525 UTC on 13775

CANADA: Radio Austria International. Multilingual station ID to discussion and newscast at 1530. *Insight Central Europe* program to segment on Polish president's support of the EU Treaty, and focus on climate changes affecting the Alps. Continued items on medical care in Slovakia, Sudan roundup to music and ID to 1559* (Jim McClanahan, Bowdon Junction, GA). 9870, 0055 Report From Austria (Fraser). Radio Netherlands relay 95425, 2318 in Dutch (MacKenzie). Radio Austria Int'l streaming/on-demand audio <http://oe1.orf.at/service/international>

2300 UTC on 6040

MOLDOVA: Radio Dniester. Steady English news with mentions of Moldova. Closing schedule to full station ID and address. French service commenced at 2315, followed by German service. Signal fair-good during this period (Bolland).

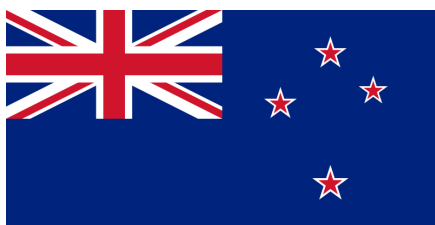
2330 UTC on 11700

BULGARIA: Radio Bulgaria. *The Way We Live* program, including a dummy police car tags speeders. SIO 554 // 9700 (Fraser). Tentative ID on this station 13640, 1845 (McClanahan).

☞ On-demand audio www.bnr.bg/

Additional loggings excluded for space constraints are posted as **Blog Logs** on the **Shortwave Central Blog** at the above web address.

*Thanks to our contributors – Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times
English broadcast unless otherwise noted.*



A Zeal for New Zealand

New Zealand is a fascinating country. With a population of just over 4 million in an island nation about the size of Colorado, it would be easy to take such a country for granted. But this would be a mistake. It is a modern dynamic nation and a key player in South Pacific affairs.

In the last century, New Zealand has evolved from loyal member of the British Empire to a nation with a fiercely independent foreign policy. Formed as a British Colony in 1840, its first parliament met in 1854. By 1907 it was considered a self-governing Dominion in the British Empire and achieved independence in 1947 (although Britain had long before relinquished any direct control over the country). The Cook Islands and Niue were former British protectorates, which were transferred to New Zealand administration in the early twentieth century. The Ross Dependency (Antarctica) was put under New Zealand administration in 1923, and Tokelau was transferred to New Zealand from the Gilbert and Ellice Islands colony in 1925.

At the same time, New Zealand has worked at its relationship with the Maori/Aboriginal peoples. Indigenous Maori people are the largest non-European ethnic group, accounting for 14.6% of the population in the 2006 census. "During the 1990s and 2000s, the New Zealand government negotiated with Māori to provide redress for breaches by the Crown of the guarantees set out in the Treaty of Waitangi in 1840. As of 2006 the government had provided over NZ\$900 million in settlements, much of it in the form of land deals. The single largest settlement, signed on 25 June 2008 with seven Māori iwi, transferred nine large tracts of forested land to Māori control." (Wikipedia)

New Zealand is also the only country in the world in which all the highest offices in the land have been occupied simultaneously by women: Queen Elizabeth II, Governor-General Dame Silvia Cartwright, Prime Minister Helen

Clark, Speaker of the House of Representatives Margaret Wilson and Chief Justice Dame Sian Elias were all in office between March 2005 and August 2006. In fact, New Zealand was the first nation in the world to give women the vote in 1893 (Wikipedia). About the time you are reading this, New Zealand will have voted in elections on November 8 (more on those later).

New Zealand was also home to perhaps one of the more famous DXers, the late Arthur Cushen. There is a lovely tribute to Mr. Cushen written by Tim Hendel at <http://nfb.org/legacy/bm/bm98/bm980411.htm>, or just "Google" Arthur Cushen.

❖ 60 Years of Radio New Zealand International

With South Pacific ties to maintain, and a desire to get its message out in an area dominated by the voices of other nations, it was determined in the 1940s that New Zealand needed an international broadcasting service. 2008 marks the 60th anniversary of that international voice. In September 1948 the then Shortwave Division of the New Zealand Broadcasting Service signed on the air. For many years, RNZI used a tiny 7.5 kW transmitter, which limited the scope of its audience. (I am more of a shortwave program listener than a DXer, but one of my favorite DXing memories is finally hearing RNZI on that puny 7.5 kW transmitter and QSLing them in the early 1984).

By the late 1980s, it became clear that for New Zealand's message to be heard in the Pacific and elsewhere, a power increase was necessary. As a result, a 100kW transmitter was installed, making reception much easier in the South Pacific target area, North America (at certain times), and elsewhere.

More recently, one of the benefits of life in the 21st century is the availability of all of Radio New Zealand's networks, both domestic and external, via the internet.

Like many radio stations around the world, RNZI struggles with budget constraints, and it may not be the most powerful transmitter, yet it

remains one of the more popular radio stations on the international bands. In fact, almost a year ago, RNZI won the International Radio Station of the Year Award.

"At a function of the Association for International Broadcasting in London, RNZI was declared the category winner.

"The station was praised for its ability and clarity of vision to deliver something that's valued by audiences throughout the region.

"Radio New Zealand International has also won the award for Most Innovative Partnership, with commendations being given to Radio Canada International and Radio Australia.

"The New Zealand High Commissioner to Britain, Jonathan Hunt, received the awards on RNZI's behalf." www.rnzi.com/pages/whatsnew.php

❖ Programming Matters

It begs the question, what makes this station from a small nation in the Pacific so popular? Clearly, the stronger transmitter and the internet help with audibility. But the big reason is the quality of the programming.

Radio New Zealand International has a nice mix of domestic Radio National programming, and specific programming, for listeners abroad. It also provides one with the opportunity to hear a number of South Pacific languages as RNZI broadcasts daily newscasts in **Samoa** (1840 UTC M-F), **Niuean** (1855 UTC M-F), **Tongan** (1940 UTC Su-Th) and **Solomon Island Pijin** at 2040 and 2115 UTC Saturdays. (Note: Times may vary as DST ends in North America)

One of the most popular programs on RNZI, from the radio hobbyist's perspective, is **Mailbox**.

"**Mailbox** is presented by Myra Oh – with regular contributors, Bryan Clark and John Durham who provide DX Reviews. Kevin Hand reviews the 'Utility Bands.' There are occasional features on Pacific Radio from David Riquish, and Chris Makerell reports on digital radio DRM. Frequency Manager Adrian Sainsbury, answers technical questions.

"You can also hear the latest solar propagation news supplied by IPS Radio & Space Services. IPS scientists keep watch on the Sun and forecast future conditions for short-wave radio reception.

"This programme is aimed at the dedicated short-wave listener."

Mailbox can be heard fortnightly on Monday at: (alternates with Spectrum) 0830, 1130, 1330, and 1530 UTC



Tagata o te Moana “(is a) weekly Pacific magazine programme featuring New Zealand and regional Pacific news, issues, information and music. This programme is also simulcast domestically on National Radio. Presented by Don Wiseman.” Fri 1910 UTC, Sat 0405 UTC, Sun 1310, 1810 UTC

Dateline Pacific – “This daily regional current affairs programme is broadcast from Monday to Saturday. **Dateline Pacific** provides a daily round-up of the very latest news from the Pacific with interviews and features with all the region’s news makers. It draws on the work of our staff and 20 Pacific journalists from around the region. Updated versions of the programme play in our **Pacific Breakfast Show**, then in the afternoon, evening and overnight. It is rebroadcast at times to suit a range of different time zones.

This programme reviews the major Pacific stories of the week, with background and reaction from the people making the news. Mon-Fri 0308, 0808, 1108, 1308, 1508, 1815, 2015 UTC; Sun-Thurs 2215 UTC

New Music Releases – A sample of the latest Kiwi music. Hosted by Hana Tatere Mon 0330 UTC, Sat 1308 UTC, Sun 0912, 1708 UTC, Tue 0330 UTC

Tradewinds - News editor Walter Zweifel compiles this weekly programme featuring Pacific regional business and economic news and features.

Tue 0830, 1130, 1330, 1530, 1708, 2115, Wed 0330 UTC

❖ Program Relays

Radio New Zealand International also relays a number of domestic programs including one of my particular favorites, **Checkpoint** with Mary Wilson. It airs at 0400 UTC, and is an afternoon drive time program. I sat in fascinated awe as she skewered politicians of all stripes, asking tough questions of the Prime Minister and other politicians as the election was called in September. At least as this is written, it’s my new favorite program, as I get ready to wrap up another day.

“Mary has been hosting **Checkpoint** since 1997.

“In that time the programme has developed into one of New Zealand’s top rating news programmes, winning awards for best programme and best presenter.

“Mary works with a strong team of senior journalists including editor Maree Corbett and producer Stephanie Brennan.

“Each day Mary does up to a dozen interviews with the key newsmakers – her uncompromising tenacious style has won respect from commentators, interviewees and listeners (and this editor!).

“Before she took the **Checkpoint** job, Mary worked as a reporter for Radio New Zealand. She started her career in 1988 on a community station in Greymouth before moving to New Plymouth, Palmerston North and then on to Wellington’s 2ZB.

“She was Radio New Zealand’s national education and health reporter and worked with a team of journalists on **Checkpoint** before taking over as presenter.”

Another program, which has been mentioned in this column before, is **Sounds Historical** with Jim Sullivan. “**Sounds Historical** with Jim Sullivan is the programme that gives listeners their chance to learn about the colourful, dramatic, and often remarkable events and people of New Zealand’s past.” It can be heard at 0700 UTC Sundays.

❖ Feeling Domestic

Radio New Zealand National is the New Zealand domestic network and has a wide range of programs. I really enjoy poking around this service for hidden gems. These include **Wayne’s Music**. “Wayne Mowat presents lost favourites, the hidden gems, the timeless classics from the music legends of the 1940s.” It is heard Saturdays at 1000 UTC and Sundays at 0940 UTC.



“**Afternoons** with Jim Mora is a programme based on the daring proposition that people are capable of thinking in the afternoon as well as in the morning. This new show aims to banish post-prandial torpor with lots of audience interactivity.

“We won’t just read out your emails and texts; we’ll be asking you to choose music you like, promote your communities and debate with our panellists.

“New features of Radio New Zealand National afternoons include:

“The Panel – guest commentators discussing the issues of the day between 4 and 5, in an hour also packed with useful information: news, traffic, weather, snow and ski reports.

“The Form Guide – New Zealand’s maven of style telling us what is hot and not in quaffing, cuisine, fashion, decor and manners.

“Reeling In The Years – history that revisits major events, the people who experienced them, and the music of the time.

“8 Months to Mars – this isn’t sci-fi; it’s gonna happen in our lifetimes or our children’s lifetimes as humans create new frontiers in space. What would well-known people do on an eight-month trip to Mars? Who would they take with them? What would they watch and listen to?

“Your Call, New Zealand – we want to visit the really small places in Aotearoa, the tiny communities full of wonderful people who will tell us about where they live and why, and what songs the locals like.

“The Best Song Ever Written – what is it!? I must hear this!! Don’t worry – we’ll be playing it every day after the 1pm news.

“Science, environment and health – Tuesdays to Fridays at 1.45pm.

“And that’s just some of the stuff...”

Afternoons can be heard weekdays from 0000 UTC.

Last December, I stumbled onto some really engaging programming on Radio New Zealand National in this time slot. Remember our winter is their summer and vice versa, so around Christmas time and into January, RNZ National airs a number of summer replacement shows. Last year, I discovered a really great concert series, featuring classic concerts by Louis Armstrong, Ella Fitzgerald, Allison Krause and others. Wonderful stuff. I also heard a quirky show called **Matinee Idle**. More on that one next month. And don’t forget, many programs from RNZI and other networks are available as podcasts or downloads.

I really like the style of RNZ/RNZI presenters. They don’t seem to take themselves too seriously; it’s a conversational approach rather than informing from on high. One gets the impression of sitting around a kitchen table in Auckland and discussing the news and the issues of the day over coffee. The Kiwi sense of humor is also rather well developed, which appeals to me. As the election campaign proceeds, all of the parties can expect a thorough, unbiased examination. An interesting contrast to the fun and games over here.

I was also interested to see that the Radio New Zealand AM Network carries all proceedings of Parliament. They seem to take government and politics much more seriously. Imagine. An election campaign with actual issues.

New Zealand. A small country with a loud voice.

NASB

National Association of Shortwave Broadcasters

Representing the privately-owned shortwave stations in the USA

- Find links to all of our members at www.shortwave.org
- Subscribe to our free Newsletter: nasbmem@rocketmail.com
- Listen to “The Voice of the NASB” on the third Saturday of each month on HCJB’s DX Party Line: 12 midnight Eastern Time on 9955 kHz
- Come to our next annual meeting May 7-8, 2009 in Nashville, TN.
- More info at www.shortwave.org/meeting.htm

NASB is a member of the HFCC (High Frequency Coordination Conference) and the DRM (Digital Radio Mondiale) Consortium

A Country List that WORKS!

Ask any serious shortwave hobbyist how many countries they've heard or verified, and chances are they'll quickly (and proudly) quote you a number. If you're still trying to manage a homemade list, I have a solution, one that is used by shortwave listeners around the globe.

The *North American Shortwave Association (NASWA)*, maintains the definitive country list used by hobbyists to track how many countries they've heard broadcasting via shortwave. The list contains radio countries which have, or have had shortwave stations on the air at some time since the end of World War II, and it includes the names of more than 250 countries.

Longtime listeners who have heard and counted countries which no longer exist due to annexation, revolution, or changes in the world map, will find a complete country list of those politically defunct countries. Newcomers will also find an expanded list to begin their quest.

The *NASWA Country List* is available as a free PDF download (248 KB) at www.naswa.net/. An opening explanation of the *NASWA Country List, Counting Rules and Practical Tips* will guide you to the country list, arranged by continents. To learn more about NASWA, the Awards Program and the club's membership, refer to their website.

ARMENIA

Voice of Russia via Yerevan, 7250 kHz. Full data *St. Petersburg Summer Gardens* card, without site or signature. Received in four weeks for an English report and two IRCs. Station address: Pyatnitskaya 25, 115326 Moscow, Russia (Bill Wilkins, Springfield, MO).

☞ Streaming audio www.ruvr.ru/index.php?lng=eng

CANADA

KBS World Radio via Sackville 9650 kHz. QSL photo card of North/South Korea summit of leaders. Received in 25 days for an English report and postcard. Station address: KBS World Radio, Global Center, Korean Broadcasting System, Yoido-dong 18, Youngdeungpo-gu, Seoul, Republic of Korea (Victor J. Latavish, Naples, FL).

☞ Streaming audio <http://world.kbs.co.kr/english/radio/>

GABON

Afrique Numéro Un, 9850, 15475 kHz. Full data verification letter signed by Hermann Madiba, plus station sticker and schedule. Received in 31 days for a French followup report and \$2.00 US. Station address: Boite Postal 1, Libreville, Gabon (Latavish).

☞ Streaming audio, podcast www.africa1.com/#



GUAM

Adventist World Radio/KSDA, 11955 kHz. Full data AWR card signed by Rhoen, plus station sticker and business card. Received in 43 days for an English report. Station address: P.O. Box 8990, Agat, Guam 96928 (Harold Woering N1FTP, Easthampton, MA)

☞ Streaming audio www.awr2.org/

MEDIUM WAVE

KGED 1680 kHz AM. *Legends 1680*. Verification letter signed by Paul Shinn-Chief Engineer. Received in 50 days for an AM report. Station address: 39 Olive Avenue, Fresno, CA 93728 USA. (Patrick

Martin, Oceanside, CA)
☞ Streaming audio www.legends1680.com/

KPIG 1510 kHz AM. Note received, signed by Mark S., plus three bumper stickers. Received in 11 days for an AM report. Station address: 1110 Main Street #16, Watsonville, CA 95076-3700 USA (or) 28 Second Street, Suite 501, San Francisco, CA 94105 USA (Martin).

☞ Streaming audio www.kpig.com/

WGOK 900 kHz AM. *Gospel 900*. Full data verification letter signed by Operations Manager. Received in 46 days after one follow up and mint stamps. Station address: 2800 Dauphin Street, Suite 104, Mobile, AL 36606 USA (Frank Hillton, Charleston, SC).

☞ Streaming audio www.gospel900.com/

WOR 710 kHz AM. *News-Talk Radio 710*. Full data blue logo station card, signed as Director of Engineering. Received in 75 days for an AM report, mint postage (returned) and souvenir postcard. Station address: 111 Broadway-3rd Floor, New York, NY 10006 USA. (Duane Hadley, TN)

☞ Streaming and on-demand audio www.wor710.com/

MONGOLIA

Voice of Mongolia, 12085 kHz. Full data *Mongolian Empire* card, signed by Mrs. Densmaa-Mail Editor. Received in 120 days for an English report, \$2.00US, SASE and mint postage. Station address: External Service, C.P.O. Box 365, Ulaanbatar 13, Mongolia (Latavish).

NIGERIA

Voice of Nigeria, 15120 kHz. Full data card of Zuma Rock initiated by Director of Programming, plus VON stickers and personal note from Producer of Listeners Letters. Received in 23 days from email reminder and many attempts over two years. Earlier English correspondence included \$2.00 US and souvenir postcards. Station address: P.M.B. 40003, Ikoyi, Lagos, Nigeria (Latavish).

RUSSIA

Deutsche Welle via Khabaraovsk 11830 kHz. Full data Stuttgart card, with site notation. Received in three months. This makes 40 DW sites verified. Station address: Customer Service, Deutsche Welle, D-53110 Bonn, Germany (Wendel Craighead, Prairie Village, KS).

☞ On-demand audio, video, podcast www.dw-world.de/

Deutsche Welle via Novosibirsk 13770 kHz. Full data *Belarus Program One* card, signed by Horst Schoyz-Transmission Manager, with site notation. Received in 14 days. Station address: (see above Khabaraovsk) (Edward Kusalik VE6EFK, Alberta, Canada).

TAIWAN

HAIV Hmong Radio 15260 via Taipei. Friendly letter from Gymbay Moua-CWHP Spoke Person, on *Congress of World Hmong People* letterhead. Received in ten days. QSL address: 1300 Woodward Street NE-Suite 6900, Minneapolis, MN 55413 USA (Craighead).

UNITED ARAB EMIRATES

Deutsche Welle via Dhabayya, Abu Dhabi 15595 kHz. Full data *Nauen Transmitter Facilities* card, signed by Horst Schoyz. Received in 14 days. Station address: (see above Deutsche Welle via Novosibirsk) (Kusalik).

WYFR/Family Radio Worldwide 7160 kHz. Full data *Three Decades of Faithful Service*, unsigned with site notation, plus religious literature. Received in 35 days for an English report and mint stamps. Station address: WYFR-Family Radio, 10400 NW 240th Street, Okeechobee, FL 34972 USA (Tom Banks, Dallas, TX).

☞ Streaming audio www.familyradio.com

USA

WBOH 5920 kHz. Full data card signed by A. Robinson, plus FBN program guide and bumper sticker. Received in 28 days for an English report. Station address: 520 Roberts Road, Newport, NC 28570 USA (Woering).

☞ Streaming audio www.fbnradio.com/

UTILITY

Coastal Station-VFF Iqaluit, Canada 6328 kHz. Received nice package from MCTS Iqaluit, including thank you note signed by Jean-Pierre Lehnert-Officer in Charge. Iqaluit postcard, schedule, visitors guide and three Coast Guard lapel pins enclosed. Received in 18 days for utility report, mint stamps and souvenir postcard. Station address: Maritime Communications and Traffic Services, Iqaluit Centre, M.C.T.S. Central & Arctic Region, P.O. Box 189, Iqaluit, NU Canada X0A 0H0. Transmission was on a trial basis, 0220 and 1420 UTC on 6328, 8376.6 kHz (Martin Foltz, CA/UDXF).



HOW TO USE THE SHORTWAVE GUIDE

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af
 ① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Saving Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC Sunday will be heard on Saturday evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. English broadcasts are listed by UTC time on ①, then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Codes	
s/Sun	Sunday
m/Mon	Monday
t	Tuesday
w	Wednesday
h	Thursday
f	Friday
a/Sat	Saturday
occ:	occasional
DRM:	Digital Radio Mondiale
irreg	Irregular broadcasts
vl	Various languages
USB:	Upper Sideband

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions. But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from

her monitoring team and MT readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

af:	Africa
al:	alternate frequency (occasional use only)
am:	The Americas
as:	Asia
ca:	Central America
do:	domestic broadcast
eu:	Europe
me:	Middle East
na:	North America
pa:	Pacific
sa:	South America
va:	various

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Thank You ...

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Shortwave Broadcast Bands

kHz	Meters
2300-2495	120 meters (Note 1)
3200-3400	90 meters (Note 1)
3900-3950	75 meters (Regional band, used for broadcasting in Asia only)
3950-4000	75 meters (Regional band, used for broadcasting in Asia and Europe)
4750-4995	60 meters (Note 1)
5005-5060	60 meters (Note 1)
5730-5900	49 meter NIB (Note 2)
5900-5950	49 meter WARC-92 band (Note 3)
5950-6200	49 meters
6200-6295	49 meter NIB (Note 2)
6890-6990	41 meter NIB (Note 2)
7100-7300	41 meters (Regional band, not allocated for broadcasting in the western hemisphere) (Note 4)
7300-7350	41 meter WARC-92 band (Note 3)
7350-7600	41 meter NIB (Note 2)
9250-9400	31 meter NIB (Note 2)
9400-9500	31 meter WARC-92 band (Note 3)
9500-9900	31 meters
11500-11600	25 meter NIB (Note 2)
11600-11650	25 meter WARC-92 band (Note 3)
11650-12050	25 meters
12050-12100	25 meter WARC-92 band (Note 3)
12100-12600	25 meter NIB (Note 2)
13570-13600	22 meter WARC-92 band (Note 3)
13600-13800	22 meters
13800-13870	22 meter WARC-92 band (Note 3)
15030-15100	19 meter NIB (Note 2)
15100-15600	19 meters
15600-15800	19 meter WARC-92 band (Note 3)
17480-17550	17 meter WARC-92 band (Note 3)
17550-17900	17 meters
18900-19020	15 meter WARC-92 band (Note 3)
21450-21850	13 meters
25670-26100	11 meters

Notes

- Note 1 Tropical bands, 120/90/60 meters are for broadcast use only in designated tropical areas of the world.
- Note 2 Broadcasters can use this frequency range on a (NIB) non-interference basis only.
- Note 3 WARC-92 bands are allocated officially for use by HF broadcasting stations in 2007.
- Note 4 WRC-03 update. After March 29, 2009, the spectrum from 7100-7200 kHz will no longer be available for broadcast purposes and will be turned over to amateur radio operations worldwide.

**GLENN HAUSER'S
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0000 UTC - 7PM EST / 6PM CST / 4PM PST

0000	0000	UK, BBC World Service	5970as	6195as
		7105as	9410as	9740as
		15335as	15360as	17615as
0000	0005	Canada, R Canada International	6100na	
0000	0020	Japan, NHK World/Radio Japan	5920eu	
		6145na	13650as	17810as
0000	0027	Czech Rep, Radio Prague	7345na	9440na
0000	0030	Australia, HCJB Global	15525as	
0000	0030	Serbia, Voice of Serbia	6190va	
0000	0030	Thailand, Radio Thailand World Svc	9570af	
0000	0030	USA, Voice of America	7555as	
0000	0045	Egypt, Radio Cairo	9280eu	
0000	0045	India, All India Radio	9705as	9950as
		11620as	11645as	13605as
0000	0045	USA, WYFR/Family Radio Worldwide	17805sa	
0000	0056	Romania, R Romania International	9775na	
0000	0057	Canada, R Canada International	11700as	
0000	0100	Anguilla, Worldwide Univ Network	6090am	
0000	0100	Australia, ABC NT Alice Springs	2310do	
		4835do		
0000	0100	Australia, ABC NT Katherine	5025do	
0000	0100	Australia, ABC NT Tennant Creek	4910do	
0000	0100	Australia, Radio Australia	9660as	12080as
		13690as	15240pa	17715as
		17775va	17795va	17750va
0000	0100	Canada, CFVP Calgary AB	6030na	
0000	0100	Canada, CKZN St John's NF	6160na	
0000	0100	Canada, CKZU Vancouver BC	6160na	
0000	0100	China, China Radio International	6020na	
		6075as	6180as	7130eu
		11885as	13750as	15125as
0000	0100	Costa Rica, Worldwide Univ Network	5030va	
		6150va	7375va	9725va
0000	0100	Germany, Deutsche Welle	9885as	15595as
		17525as		
0000	0100	Guyana, Voice of Guyana	3291do	
0000	0100	Malaysia, RTM/Traxx FM	7295as	
0000	0100	DRM New Zealand, Radio NZ International	17675pa	
0000	0100	New Zealand, Radio NZ International	15720pa	
0000	0100	Papua New Guinea, Wantok R. Light	7325va	
0000	0100	Spain, Radio Exterior Espana	6055na	
0000	0100	Ukraine, R Ukraine International	7440na	
0000	0100	USA, Armed Forces Radio Network	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12132usb	13362usb
0000	0100	USA, WBCQ Monticello ME	7415am	9330am
0000	0100	USA, WBOH Newport NC	5920am	
0000	0100	USA, WEWN Vandiver AL	11520me	
0000	0100	USA, WHRA Greenbush ME	5850eu	
0000	0100	USA, WHRI Cypress Creek SC	5875na	
		7385na		
0000	0100	USA, WINB Red Lion PA	9265am	
0000	0100	USA, WRMI Miami FL	9955am	
0000	0100	USA, WTJC Newport NC	9370na	
0000	0100	USA, WWCN Nashville TN	5070na	5935na
		7465na	9980na	
0000	0100	USA, WWRB Manchester TN	3185va	5050na
		5745va	6180va	
0000	0100	USA, WYFR/Family Radio Worldwide	5950na	
		6985na	9505na	11835ca
0000	0100	Zambia CVC Intl/Christian Voice	4965af	
0005	0057	Canada, R Canada International	6100na	
0030	0045	Albania, Radio Tirana	9390na	
0030	0045	Germany, Pan American BC	9640as	
0030	0100	Australia, Radio Australia	15415as	
0030	0100	China, China Radio International	11730as	
0030	0100	Lithuania, Radio Vilnius	11690na	
0030	0100	Thailand, Radio Thailand World Svc	12120na	
0030	0100	UK, Bible Voice BC	9490as	
0030	0100	USA, Voice of America	9715va	9780va
		11725va	15185va	15205va
		15560va	17820va	15290va

0100 UTC - 8PM EST / 7PM CST / 5PM PST

0100	0105	twhfa	Canada, R Canada International	6100na
0100	0127		China, China Radio International	11730as
0100	0127		Czech Rep, Radio Prague	6200na
0100	0127		Slovakia, R Slovakia International	5930na
			9440sa	
0100	0128		Vietnam, Voice of Vietnam	6175na
0100	0130		Australia, Radio Australia	17775as
0100	0130		Serbia, Voice of Serbia	6190va
0100	0155		Turkey, Voice of Turkey	9620am
0100	0157		China, China Radio International	6020na

			6175as	9470eu	9535as	9570na
			9580na	9790na	11870as	
0100	0158	DRM	New Zealand, Radio NZ International			17675pa
0100	0159		Canada, R Canada International			9620as
0100	0200		Anguilla, Worldwide Univ Network			6090am
0100	0200		Australia, ABC NT Katherine	5025do		
0100	0200		Australia, ABC NT Tennant Creek			4910do
0100	0200		Australia, Radio Australia	9660as		12080as
			13690as	15240pa	15415as	17715as
			17795va			
0100	0200		Canada, CFVP Calgary AB	6030na		
0100	0200		Canada, CKZN St John's NF	6160na		
0100	0200		Canada, CKZU Vancouver BC			6160na
0100	0200		Costa Rica, Worldwide Univ Network			5030va
			6150va	7375va	9725va	
0100	0200		Cuba, Radio Havana Cuba	6000na		6140na
0100	0200		Guyana, Voice of Guyana	3291do		
0100	0200		Malaysia, RTM/Traxx FM	7295as		
0100	0200		New Zealand, Radio NZ International			15720pa
0100	0200		North Korea, Voice of Korea	4405as		7140as
			9345as	9730as	11735am	12760am
			15180am			
0100	0200	vi	Papua New Guinea, Wantok R. Light			7325va
0100	0200		Russia, Voice of Russia	7250na		9665na
			13755na	15425na		
0100	0200		Sri Lanka, SLBC	6005as	9770as	15745as
0100	0200		Taiwan, R Taiwan International			11875as
0100	0200		UK, BBC World Service	7320as		9410as
			9740as	11750as	11955as	15310as
			15335as	15360as	17615as	
0100	0200		USA, Armed Forces Radio Network			4319usb
			5446usb	5765usb	6350usb	7811usb
			10320usb	12133usb	13362usb	
0100	0200		USA, KWHR Naalehu HI	17800as		
0100	0200		USA, Voice of America	7430va		9780va
			11705as			
0100	0200		USA, WBCQ Monticello ME	5110am		7415am
0100	0200		USA, WBOH Newport NC	5920am		
0100	0200		USA, WEWN Vandiver AL	11520me		
0100	0200		USA, WHRA Greenbush ME	5850eu		
0100	0200		USA, WHRI Cypress Creek SC			7385na
0100	0200		USA, WINB Red Lion PA	9265am		
0100	0200		USA, WRMI Miami FL	9955am		
0100	0200		USA, WTJC Newport NC	9370na		
0100	0200		USA, WWCN Nashville TN	5070na		5935na
			7465na	9980na		
0100	0200		USA, WWRB Manchester TN	3185va		5050na
			5745va			
0100	0200		USA, WYFR/Family Radio Worldwide			5950na
			6985na	9505na	15195as	15440na
0100	0200		Uzbekistan, CVC International			11790as
0100	0200		Zambia, CVC Intl/Christian Voice			4965af
0130	0200		Iran, Voice of the Islamic Rep of Iran			7235na
			9495na			
0130	0200		Sweden, Radio Sweden		6010na	
0130	0200	twhfa	USA, Voice of America		6040va	9820va
0140	0200		Vatican City, Vatican Radio		9650na	
0145	0200	twhfas	Albania, Radio Tirana		9390na	

0200 UTC - 9PM EST / 8PM CST / 6PM PST

0200	0227		Iran, Voice of the Islamic Rep of Iran	7235na
			9495na	
0200	0230		South Korea, KBS World Radio	9580sa
0200	0230		Thailand, Radio Thailand World Svc	15275na
0200	0245		USA, WYFR/Family Radio Worldwide	11835ca
0200	0257		China, China Radio International	11770as
			13640as	
0200	0259	Sun	Lithuania, Mighty KBC Radio	6055na
0200	0300		Anguilla, Worldwide Univ Network	6090am
0200	0300	mtwhf	Argentina, RAE	9690al
0200	0300		Australia, ABC NT Alice Springs	15345
			4835do	2310do
0200	0300		Australia, ABC NT Katherine	5025do
0200	0300		Australia, ABC NT Tennant Creek	4910do
0200	0300		Australia, Radio Australia	9660as
			13690as	15240pa
			15415as	15515as
			17750va	21725va
0200	0300		Bulgaria, Radio Bulgaria	9700na
0200	0300		Canada, CFVP Calgary AB	6030na
0200	0300		Canada, CKZN St John's NF	6160na
0200	0300		Canada, CKZU Vancouver BC	6160na
0200	0300		Costa Rica, Worldwide Univ Network	5030va
			6150va	7375va
			9725va	
0200	0300		Cuba, Radio Havana Cuba	6000na
0200	0300		Egypt, Radio Cairo	7270na
0200	0300		Guyana, Voice of Guyana	3291do
0200	0300		Indonesia, Voice of Indonesia	9526va
			11784al	

0200	0300	Malaysia, RTM/Traxx FM	7295as	
0200	0300	DRM New Zealand, Radio NZ International	17675pa	
0200	0300	New Zealand, Radio NZ International	15720pa	
0200	0300	North Korea, Voice of Korea	3560as	13650as
			15100as	
0200	0300	vi Papua New Guinea, Wantok R. Light	7325va	
0200	0300	Philippines, Radio Pilipinas	11880va	15285va
			15510va	
0200	0300	Russia, Voice of Russia	9480na	9665na
			9860na	13635na
			15425na	
0200	0300	Sri Lanka, SLBC	6005as	9770as
0200	0300	Taiwan, R Taiwan International		5950na
			9680na	
0200	0300	UK, BBC World Service	6035af	6195as
			9410va	11955as
			15310as	
0200	0300	USA, Armed Forces Radio Network		4319usb
			5446usb	5765usb
			6350usb	7811usb
			10320usb	12133usb
			13362usb	
0200	0300	USA, KJES Vado NM	7555na	
0200	0300	USA, KJES Vado NM	7555na	
0200	0300	USA, KWHR Naalehu HI	17800as	
0200	0300	USA, WBCQ Monticello ME	5110am	7415am
0200	0300	USA, WBOH Newport NC	5920am	
0200	0300	USA, WEWN Vandiver AL	11520me	
0200	0300	USA, WHRA Greenbush ME	5850eu	
0200	0300	USA, WHRI Cypress Creek SC		5875na
			7385na	
0200	0300	USA, WINB Red Lion PA	9265am	
0200	0300	USA, WRMI Miami FL	9955am	
0200	0300	USA, WTJC Newport NC	9370na	
0200	0300	USA, WWCR Nashville TN	3215na	5070na
			5890na	5935na
0200	0300	USA, WWRB Manchester TN	3185va	5050na
			5745va	
0200	0300	USA, WYFR/Family Radio Worldwide	5950na	
			5985am	6985na
			9505na	11855am
0200	0300	Uzbekistan, CVC International	11790as	
0200	0300	Zambia, CVC Intl/Christian Voice	4965af	
0215	0230	Nepal, Radio Nepal	5005as	
0230	0257	China, China Radio International		15435me
0230	0258	Vietnam, Voice of Vietnam	6175ca	
0230	0300	Albania, Radio Tirana	7425na	
0230	0300	Netherlands, R Netherlands Worldwide	11550as	
0230	0300	South Korea, KBS World Radio	9560na	
0230	0300	Sweden, Radio Sweden	6010na	11550va
0245	0300	Myanmar, Myanmar Radio	9731do	
0250	0300	Vatican City, Vatican Radio	6040na	7305na
0255	0300	vi Rwanda, Radio Rwanda	6055do	

0300 UTC - 10PM EST / 9PM CST / 7PM PST

0300	0315	vi Croatia, Croatian Radio	9925na	
0300	0319	Vatican City, Vatican Radio	6040na	7305na
0300	0327	Czech Rep, Radio Prague	7345na	9870na
0300	0327	Vatican City, Vatican Radio	7360af	9660af
0300	0330	Egypt, Radio Cairo	7270na	
0300	0330	Myanmar, Myanmar Radio	9731do	
0300	0330	Philippines, Radio Pilipinas	11880va	15285va
			15510va	
0300	0330	Sri Lanka, SLBC	6005as	9770as
0300	0330	Swaziland, Trans World Radio		3200af
0300	0330	UK, Sudan Radio Service	5975af	
0300	0330	USA, KJES Vado NM	7555na	
0300	0355	South Africa, Channel Africa	3345af	6135af
0300	0355	Turkey, Voice of Turkey	5975am	7265va
			7325na	
0300	0356	Romania, R Romania International		6150na
			9645na	9735as
			11895as	
0300	0357	China, China Radio International		9690na
			9790na	15110as
			11770as	13750as
			15120as	15785as
0300	0400	Anguilla, Worldwide Univ Network		6090am
0300	0400	Australia, ABC NT Alice Springs		2310do
			4835do	
0300	0400	Australia, ABC NT Katherine	5025do	
0300	0400	Australia, ABC NT Tennant Creek		4910do
0300	0400	Australia, Radio Australia	9660as	12080as
			13690as	15240pa
			15415as	15515as
			17750va	21725va
0300	0400	Canada, CBC NQ SW Service	9625na	
0300	0400	Canada, CFVP Calgary AB	6030na	
0300	0400	Canada, CKZN St John's NF	6160na	
0300	0400	Canada, CKZU Vancouver BC		6160na
0300	0400	Costa Rica, Worldwide Univ Network		5030va
			6150va	7375va
			9725va	
0300	0400	Cuba, Radio Havana Cuba	6000na	6140na
0300	0400	Germany, Deutsche Welle	13770as	15595as
0300	0400	Guyana, Voice of Guyana	3291do	

0300	0400	Malaysia, RTM/Traxx FM	7295as	
0300	0400	Malaysia, RTM/Voice of Malaysia	6175as	
			9750as	15295as
0300	0400	New Zealand, Radio NZ International		15720pa
0300	0400	DRM New Zealand, Radio NZ International		17675pa
0300	0400	North Korea, Voice of Korea	4405as	7140as
			9345as	9730as
0300	0400	Oman, Radio Oman	15355as	
0300	0400	vi Papua New Guinea, Wantok R. Light	7325va	
0300	0400	Russia, Voice of Russia	5900na	9800na
			9435na	9480na
			9665na	9860na
			12065na	15735as
0300	0400	vi Rwanda, Radio Rwanda	6055do	
0300	0400	Taiwan, R Taiwan International		5950na
			15215sa	15320as
0300	0400	UK, BBC World Service	3255af	6005af
			6145af	6190af
			6195as	7160af
			9410va	9750af
			12035af	15360as
			15310as	17790as
0300	0400	Ukraine, R Ukraine International		7440na
0300	0400	USA, Armed Forces Radio Network		4319usb
			5446usb	5765usb
			6350usb	7811usb
			10320usb	12133usb
			13362usb	
0300	0400	USA, KWHR Naalehu HI	17800as	
0300	0400	USA, Voice of America	4930af	6080af
			9885af	12085af
			15580af	
			5110am	7415am
0300	0400	USA, WBCQ Monticello ME	5110am	
0300	0400	USA, WBOH Newport NC	5920am	
0300	0400	USA, WEWN Vandiver AL	11520me	
0300	0400	USA, WHRA Greenbush ME	5850eu	
0300	0400	mtwhf USA, WHRI Cypress Creek SC		6110na
0300	0400	Sat/Sun USA, WHRI Cypress Creek SC		7385am
0300	0400	USA, WHRI Cypress Creek SC		5875na
0300	0400	USA, WRMI Miami FL	9955am	
0300	0400	USA, WTJC Newport NC	9370na	
0300	0400	USA, WWCR Nashville TN	3215na	5070na
			5890na	5935na
0300	0400	USA, WWRB Manchester TN	3185va	5050na
			5745va	
0300	0400	USA, WYFR/Family Radio Worldwide	5950na	
			6085na	9505na
			11740sa	15255as
0300	0400	Uzbekistan, CVC International		13680as
			15515as	
0300	0400	Zambia, CVC Intl/Christian Voice	4965af	
0330	0357	Czech Rep, Radio Prague	6080na	9445as
			11600as	
0330	0358	Vietnam, Voice of Vietnam	6175ca	
0330	0400	Albania, Radio Tirana	7425na	
0330	0400	twthfas UK, BBC World Service	11945af	

0400 UTC - 11PM EST / 10PM CST / 8PM PST

0400	0430	mtwhf France, Radio France International	9805af	
			11995af	
0400	0430	Netherlands, R Netherlands Worldwide	9575af	
0400	0430	USA, KWHR Naalehu HI	17800as	
0400	0430	USA, Voice of America	4930af	4960af
			6080af	9575af
			11835af	12080af
			15580af	
0400	0430	USA, WWRB Manchester TN	3185va	
0400	0445	USA, WYFR/Family Radio Worldwide	6985na	
			9505na	
0400	0457	China, China Radio International	6020na	
			6080as	13750as
			15120as	15785as
			17730as	17855as
0400	0458	New Zealand, Radio NZ International		15720pa
0400	0458	DRM New Zealand, Radio NZ International		17675pa
0400	0459	South Africa, Channel Africa	3345af	
0400	0500	Anguilla, Worldwide Univ Network		6090am
0400	0500	Australia, ABC NT Alice Springs		2310do
			4835do	
0400	0500	Australia, ABC NT Katherine	5025do	
0400	0500	Australia, ABC NT Tennant Creek		4910do
0400	0500	Australia, Radio Australia	9660as	12080as
			13690as	15240pa
			15415as	17750va
			21725va	
0400	0500	twthfas Canada, CBC NQ SW Service	9625na	
0400	0500	Canada, CKZU St John's NF	6160na	
0400	0500	Canada, CKZU Vancouver BC		6160na
0400	0500	Costa Rica, Worldwide Univ Network		5030va
			6150va	7375va
			9725va	
0400	0500	Cuba, Radio Havana Cuba	6000na	6140na
0400	0500	Germany, Deutsche Welle	7225af	7245af
			12045af	15445af
0400	0500	Guyana, Voice of Guyana	3291do	
0400	0500	Malaysia, RTM/Traxx FM	7295as	
0400	0500	Malaysia, RTM/Voice of Malaysia	6175as	
			9750as	15295as

0400	0500		Netherlands, R Netherlands Worldwide	12080af
0400	0500	vl	Papua New Guinea, Wantok R. Light	7325va
0400	0500		Russia, Voice of Russia	5900na
			9665na 9860na 13635na 15735as	
0400	0500	vl	Rwanda, Radio Rwanda	6055do
0400	0500	vl	Uganda, UBC Radio	4976do
0400	0500	DRM	UK, BBC World Service	5875eu
0400	0500		UK, BBC World Service	3255af 6005af
			6190af 6195va 7120af 7160af	
			11945af 12035va 12095as 15360as	
			15565va 17790as	
0400	0500		USA, Armed Forces Radio Network	4319usb
			5446usb 5765usb 6350usb 7811usb	
			10320usb 12133usb 13362usb	
0400	0500		USA, WBCQ Monticello ME	5110am
0400	0500		USA, WBOH Newport NC	5920am
0400	0500		USA, WEWN Vandiver AL	11520me
0400	0500		USA, WHRA Greenbush ME	5850eu
0400	0500		USA, WHRI Cypress Creek SC	5875am
			7365am	
0400	0500		USA, WRMI Miami FL	9955am
0400	0500		USA, WTJC Newport NC	9370na
0400	0500		USA, WWCR Nashville TN	3215na
			5890na 5935na	
0400	0500		USA, WWRB Manchester TN	3185va
0400	0500		USA, WYFR/Family Radio Worldwide	5950na
			6915na 7730va 9680na	
0400	0500		Uzbekistan, CVC International	13680as
			15515as	
0400	0500		Zambia, CVC Intl/Christian Voice	4965af
0430	0500		Australia, Radio Australia	15415as
0430	0500	mtwhf	Italy, IRRS	5990va
0430	0500		Nigeria, Radio Nigeria/Kaduna	6090do
0430	0500	mtwhf	Swaziland, Trans World Radio	3200af
			4775af	
0459	0500		New Zealand, Radio NZ International	11725pa
0459	0500	DRM	New Zealand, Radio NZ International	15720pa

0500 UTC - 12AM EST / 11PM CST / 9PM PST

0500	0507	twhf	Canada, CBC NQ SW Service	9625na
0500	0527		Vatican City, Vatican Radio	9660af 11625af
			13765af	
0500	0529		Vatican City, Vatican Radio	5965eu 7250eu
0500	0530	mtwhf	France, Radio France International	13680af
			15160af	
0500	0530		Germany, Deutsche Welle	9700af 9825me
0500	0530	mtwhf	Italy, IRRS	5990va
0500	0530		Japan, NHK World/Radio Japan	5975eu
			6110na 11970af 15325as	
0500	0555		South Africa, Channel Africa	7230af 9735af
0500	0557		China, China Radio International	6020na
			6190na 11880as 15350as 15465as	
			17505me 17730as 17855as	
0500	0600		Anguilla, Worldwide Univ Network	6090am
0500	0600		Australia, ABC NT Alice Springs	2310do
			4835do	
0500	0600		Australia, ABC NT Katherine	5025do
0500	0600		Australia, ABC NT Tennant Creek	4910do
0500	0600		Australia, Radio Australia	9660as 12080as
			13630as 13690pa 15160as 15240pa	
			17750va	
0500	0600		Bhutan, Bhutan Broadcasting Svc	6035as
0500	0600		Canada, CKZN St John's NF	6160na
0500	0600		Canada, CKZU Vancouver BC	6160na
0500	0600		Costa Rica, Worldwide Univ Network	5030va
			6150va 7375va 9725va	
0500	0600		Cuba, Radio Havana Cuba	6000na 6060na
			6140na 9550na 11760am	
0500	0600		Guyana, Voice of Guyana	3291do
0500	0600		Kuwait, Radio Kuwait	15110me
0500	0600		Malaysia, RTM/Traxx FM	7295as
0500	0600		Malaysia, RTM/Voice of Malaysia	6175as
			9750as 15295as	
0500	0600		New Zealand, Radio NZ International	11725pa
0500	0600	DRM	New Zealand, Radio NZ International	15720pa
0500	0600		Nigeria, Radio Nigeria/Kaduna	4770do
0500	0600	vl	Papua New Guinea, Wantok R. Light	7325va
0500	0600		Russia, Voice of Russia	17635pa 21790pa
0500	0600		Swaziland, Trans World Radio	3200af
0500	0600		Swaziland, Trans World Radio	4775af
			6120af 9500af	
0500	0600	vl	Uganda, UBC Radio	4976do 5026do
0500	0600		UK, BBC World Service	3255af 6005af
			6190af 6195va 7120af 7160af	
			9410va 11945af 12095as 15310as	
			15360as 15420af 15565va 17640af	
			17790as	

0500	0600	DRM	UK, BBC World Service	6195af
0500	0600		Ukraine, R Ukraine International	9945eu
0500	0600		USA, Armed Forces Radio Network	4319usb
			5446usb 5765usb 6350usb 7811usb	
			10320usb 12133usb 13362usb	
0500	0600		USA, KWHR Naalehu HI	9930as 13650as
0500	0600		USA, Voice of America	4930af 6080af
			6180af 12080af 15580af	
0500	0600		USA, WBCQ Monticello ME	5110am
0500	0600		USA, WBOH Newport NC	5920am
0500	0600		USA, WEWN Vandiver AL	11520me
0500	0600	Sat/Sun	USA, WHRA Greenbush ME	7490va
0500	0600		USA, WHRI Cypress Creek SC	5875am
			7365am	
0500	0600		USA, WRMI Miami FL	9955am
0500	0600		USA, WTJC Newport NC	9370na
0500	0600		USA, WWCR Nashville TN	3215na
			5890na 5935na	
0500	0600		USA, WWRB Manchester TN	3185va
0500	0600		USA, WYFR/Family Radio Worldwide	5950na
			6915na 9355va 9680na	
0500	0600		Uzbekistan, CVC International	13680as
			15515as	
0500	0600		Zambia, CVC Intl/Christian Voice	4965af
			9430af	
0515	0530	vl	Rwanda, Radio Rwanda	6055do
0530	0556		Romania, R Romania International	9655eu
			11830eu 15435pa 17770pa	
0530	0600		Australia, Radio Australia	15415as
0530	0600	vl	Rwanda, Radio Rwanda	6055do
0530	0600		Thailand, Radio Thailand World Svc	17655va
0530	0600	mtwhf	UK, Sudan Radio Service	9525af 13720af

0600 UTC - 1AM EST / 12AM CST / 10PM PST

0600	0615	Sat/Sun	South Africa, Trans World Radio	11640af
0600	0630	mtwhf	France, Radio France International	11725af
			15160af 17800af 17800af	
0600	0630		Germany, Deutsche Welle	7310af 15275af
0600	0630		Nigeria, Radio, National Svc/Abuja	7275do
0600	0645	mtwhf	South Africa, Trans World Radio	11640af
0600	0655		South Africa, Channel Africa	7230af 15255af
0600	0657		China, China Radio International	11710af
			11870me 11880as 13660as 15140me	
			15350as 15465as 17505va 17540as	
			17710as	
0600	0658		New Zealand, Radio NZ International	11725pa
0600	0658	DRM	New Zealand, Radio NZ International	15720pa
0600	0700		Anguilla, Worldwide Univ Network	6090am
0600	0700		Australia, ABC NT Alice Springs	2310do
			4835do	
0600	0700		Australia, ABC NT Katherine	5025do
0600	0700		Australia, ABC NT Tennant Creek	4910do
0600	0700		Australia, CVC International	15335as
0600	0700	Sat/Sun	Australia, Radio Australia	15415as
0600	0700		Australia, Radio Australia	9660as 12080as
			13630as 13690as 15160as 15240pa	
			15415as 15515pa 17750va	
0600	0700		Canada, CFVP Calgary AB	6030na
0600	0700		Canada, CKZN St John's NF	6160na
0600	0700		Canada, CKZU Vancouver BC	6160na
0600	0700		Costa Rica, Worldwide Univ Network	5030va
			6150va 7375va 9725va	
0600	0700		Cuba, Radio Havana Cuba	6000na 6060na
			6140na 9550na 11760na	
0600	0700		Guyana, Voice of Guyana	3291do
0600	0700		Kuwait, Radio Kuwait	15110me
0600	0700		Malaysia, RTM/Traxx FM	7295as
0600	0700		Malaysia, RTM/Voice of Malaysia	6175as
			9750as 15295as	
0600	0700		Nigeria, Radio Nigeria/Kaduna	4770do
0600	0700	vl	Papua New Guinea, Wantok R. Light	7325va
0600	0700		Russia, Voice of Russia	17635pa 21790pa
0600	0700		Swaziland, Trans World Radio	4775af
			6120af 9500af	
0600	0700		UK, BBC World Service	6005af 6190af
			6195va 9860af 11765af 12095as	
			13820af 15310as 15400af 17640af	
			17790as	
0600	0700	Sat/Sun	UK, BBC World Service	15420af
0600	0700	DRM	UK, BBC World Service	6195af
0600	0700		USA, Armed Forces Radio Network	4319usb
			5446usb 5765usb 6350usb 7811usb	
			10320usb 12133usb 13362usb	
0600	0700		USA, KWHR Naalehu HI	9930as 13650as
0600	0700		USA, Voice of America	6080af 12080af
			15580af	
0600	0700		USA, WBCQ Monticello ME	5110am

0600	0700		USA, WBOH Newport NC	5920am	
0600	0700		USA, WEWN Vandiver AL	7570eu	
0600	0700	Sat/Sun	USA, WHRA Greenbush ME	7490va	
0600	0700		USA, WHRI Cypress Creek SC	5875am	
			7365am		
0600	0700		USA, WRMI Miami FL	9955am	
0600	0700		USA, WTJC Newport NC	9370na	
0600	0700		USA, WWCR Nashville TN	3215na	5070na
			5890na	5935na	
0600	0700		USA, WWRB Manchester TN	3185va	
0600	0700		USA, WYFR/Family Radio Worldwide	5850na	
			7520va	9680na	11530af
0600	0700		Uzbekistan, CVC International	15515as	
0600	0700	vl	Vanuatu, Radio Vanatu	3945al	7260do
0600	0700		Zambia, CVC Intl/Christian Voice	6065af	
			13590af		
0630	0644	mtwhfa	Vatican City, Vatican Radio	5965eu	7250eu
			9645eu	11740eu	15595eu
0630	0700		Bulgaria, Radio Bulgaria	7200na	9400eu
0630	0700		Vatican City, Vatican Radio	11625af	13765af
			15570af		
0645	0700	Sun	Germany, Trans World Radio Europe	6105eu	
0645	0700	Sun	Monaco, Trans World Radio Europe	9800eu	
0659	0700		New Zealand, Radio NZ International	9765pa	
0659	0700	DRM	New Zealand, Radio NZ International	9870pa	

0700 UTC - 2AM EST / 1AM CST / 11PM PST

0700	0703	vl	Croatia, Croatian Radio	11690pa	
0700	0706		UK, BBC World Service	6005af	
0700	0727		Czech Rep, Radio Prague	9880eu	11600eu
0700	0727		Slovakia, R Slovakia International	9440pa	
			11650pa		
0700	0730		France, Radio France International	13675af	
0700	0730	mtwhf	UK, BBC World Service	15575as	
0700	0745		USA, WYFR/Family Radio Worldwide	7520va	
0700	0750	mtwhf	Germany, Trans World Radio Europe	6105eu	
0700	0750	mtwhf	Monaco, Trans World Radio Europe	9800eu	
0700	0757		China, China Radio International	11880as	
			13660as	13710eu	15350as
			17490eu	17540as	17710as
0700	0800		Anguilla, Worldwide Univ Network	6090am	
0700	0800		Australia, ABC NT Alice Springs	2310do	
			4835do		
0700	0800		Australia, ABC NT Katherine	5025do	
0700	0800		Australia, ABC NT Tennant Creek	4910do	
0700	0800		Australia, CVC International	15335as	
0700	0800		Australia, Radio Australia	9475as	9660as
			9710as	13630pa	15160as
			15415as	17750va	15240pa
0700	0800		Bhutan, Bhutan Broadcasting Svc	6035as	
0700	0800		Canada, CFVP Calgary AB	6030na	
0700	0800		Canada, CKZN St John's NF	6160na	
0700	0800		Canada, CKZU Vancouver BC	6160na	
0700	0800		Costa Rica, Worldwide Univ Network	5030va	
			6150va	7375va	9725va
0700	0800	DRM	Germany, Deutsche Welle	7310eu	
0700	0800	Sun	Germany, Trans World Radio Europe	6105eu	
0700	0800		Guyana, Voice of Guyana	3291do	
0700	0800		Kuwait, Radio Kuwait	15110me	
0700	0800	Sat	Latvia, Radio SWH	9290eu	
0700	0800		Liberia, Star Radio	9525af	
0700	0800		Malaysia, RTM/Traxx FM	7295as	
0700	0800		Malaysia, RTM/Voice of Malaysia	6175as	
			9750as	15295as	
0700	0800	Sun	Monaco, Trans World Radio Europe	9800eu	
0700	0800		Myanmar, Myanma Radio	9731do	
0700	0800		New Zealand, Radio NZ International	9765pa	
0700	0800	DRM	New Zealand, Radio NZ International	9870pa	
0700	0800		Nigeria, Radio Nigeria/Kaduna	4770do	
0700	0800	vl	Papua New Guinea, R East New Britain	3385do	
0700	0800	vl	Papua New Guinea, Wantok R. Light	7325va	
0700	0800		Russia, Voice of Russia	17495af	17635af
0700	0800	vl	Solomon Islands, SIBC	5020do	
0700	0800		South Africa, Channel Africa	7230af	
0700	0800		Swaziland, Trans World Radio	4775af	
			6120af	9500af	
0700	0800		Taiwan, R Taiwan International	5950na	
0700	0800	Sat/Sun	UK, BBC World Service	15400af	15420af
			15575as		
0700	0800		UK, BBC World Service	6190af	9860af
			11760me	13820af	15310as
			17830af		17790as
0700	0800	mtwhf	UK, BBC World Service	15400af	
0700	0800	Sat/Sun	UK, Bible Voice BC	5945eu	
0700	0800		USA, Armed Forces Radio Network	4319usb	
			5446usb	5765usb	6350usb
			10320usb	12133usb	13362usb

0700	0800		USA, KWHR Naalehu HI	9930as	13650as
0700	0800		USA, WBCQ Monticello ME	5110am	
0700	0800		USA, WBOH Newport NC	5920am	
0700	0800		USA, WEWN Vandiver AL	7570eu	
0700	0800	mtwhf	USA, WHRI Cypress Creek SC		11565am
0700	0800		USA, WHRI Cypress Creek SC		7385na
0700	0800	Sat/Sun	USA, WHRI Cypress Creek SC		5875va
0700	0800		USA, WRMI Miami FL	9955am	
0700	0800		USA, WTJC Newport NC	9370na	
0700	0800		USA, WWCR Nashville TN	3215na	5070na
			5890na	5935na	
0700	0800		USA, WWRB Manchester TN	3185va	
0700	0800		USA, WYFR/Family Radio Worldwide	5985na	
			6915na	9505na	9715na
0700	0800		Uzbekistan, CVC International	15515as	
0700	0800	vl	Vanuatu, Radio Vanatu	3945al	7260do
0700	0800		Zambia, CVC Intl/Christian Voice	6065af	
			13590af		
0715	0750	Sat	Germany, Trans World Radio Europe	6105eu	
0715	0750	Sat	Monaco, Trans World Radio Europe	9800eu	
0745	0800	vl/ f	UK, Bible Voice BC	5945eu	
0750	0800		Saudi Arabia, BSKSA	17785as	

0800 UTC - 3AM EST / 2AM CST / 12AM PST

0800	0815	Sat	Guam, KTWR/Trans World Radio	11840pa	
0800	0815	Sat/Sun	UK, Bible Voice BC	5945eu	
0800	0820	Sun	Germany, Trans World Radio Europe	6105eu	
0800	0820	Sun	Monaco, Trans World Radio Europe	9800eu	
0800	0825		Malaysia, RTM/Voice of Malaysia	6175as	
			9750as	15295as	
0800	0830		Australia, ABC NT Katherine	5025do	
0800	0830		Australia, ABC NT Tennant Creek	4910do	
0800	0830		Myanmar, Myanma Radio	9731do	
0800	0835	mtwhf	Guam, KTWR/Trans World Radio	11840pa	
0800	0845		USA, WYFR/Family Radio Worldwide	5950ca	
			9930af		
0800	0857		China, China Radio International	11620as	
			11880as	13710eu	15350as
			17490eu	17540as	15465as
0800	0900		Anguilla, Worldwide Univ Network	6090am	
0800	0900		Australia, ABC NT Alice Springs	2310do	
			4835do		
0800	0900		Australia, CVC International	15335as	
0800	0900		Australia, Radio Australia	9475as	9580va
			9590va	9710as	12080pa
			15415as	17750va	13630as
0800	0900		Bhutan, Bhutan Broadcasting Svc	6035as	
0800	0900		Canada, CFVP Calgary AB	6030na	
0800	0900		Canada, CKZN St John's NF	6160na	
0800	0900		Canada, CKZU Vancouver BC	6160na	
0800	0900		Costa Rica, Worldwide Univ Network	5030va	
			6150va	7375va	9725va
0800	0900		Guyana, Voice of Guyana	3291do	
0800	0900		Malaysia, RTM/Traxx FM	7295as	
0800	0900		New Zealand, Radio NZ International	9765pa	
0800	0900	DRM	New Zealand, Radio NZ International	9870pa	
0800	0900		Nigeria, Radio Nigeria/Kaduna	4770do	
0800	0900		Nigeria, Voice of Nigeria/Lagos	9690af	
0800	0900	vl	Papua New Guinea, R East New Britain	3385do	
0800	0900	vl	Papua New Guinea, Wantok R. Light	7325va	
0800	0900		Russia, Voice of Russia	17495af	17635af
0800	0900	DRM	Russia, Voice of Russia	12060eu	15545eu
0800	0900	vl	Solomon Islands, SIBC	5020do	
0800	0900		South Africa, Channel Africa	9625af	
0800	0900	Sun	South Africa, SA Radio League	7205af	
			17570af		
0800	0900		South Korea, KBS World Radio	9570as	
0800	0900		Swaziland, Trans World Radio	4775af	
			6120af	9500af	
0800	0900		UK, BBC World Service	6190af	9860af
			11760me	15310as	15400af
			17790af	17830af	21470af
0800	0900	Sat/Sun	UK, BBC World Service	15575as	
0800	0900		USA, Armed Forces Radio Network	4319usb	
			5446usb	5765usb	6350usb
			10320usb	12133usb	13362usb
0800	0900		USA, KNLS Anchor Point AK	7355as	
0800	0900		USA, KWHR Naalehu HI	9930as	
0800	0900		USA, WBCQ Monticello ME	5110am	
0800	0900		USA, WBOH Newport NC	5920am	
0800	0900		USA, WEWN Vandiver AL	9355as	
0800	0900		USA, WHRI Cypress Creek SC		7385am
0800	0900	mtwhf	USA, WHRI Cypress Creek SC		11565va
0800	0900	Sat/Sun	USA, WHRI Cypress Creek SC		5875va
0800	0900		USA, WRMI Miami FL	9955am	
0800	0900		USA, WTJC Newport NC	9370na	
0800	0900		USA, WWCR Nashville TN	3215na	5070na

0800 0900	5890na	5935na	
0800 0900	USA, WWRB Manchester TN	3185va	
	USA, WYFR/Family Radio Worldwide	5985na	
	6915na		
0800 0900	Uzbekistan, CVC International	15515as	
0800 0900 vl	Vanuatu, Radio Vanatu	3945af	7260do
0800 0900	Zambia, CVC Intl/Christian Voice	6065af	
	13590af		
0805 0900 tf	Guam, KTW/Trans World Radio	15170as	
0820 0900 w	Guam, KTW/Trans World Radio	15170as	
0830 0900	Australia, ABC NT Katherine	2485do	
0830 0900	Australia, ABC NT Tennant Creek	2325do	
0830 0900 m	Guam, KTW/Trans World Radio	15170as	
0830 0900	Lithuania, Radio Vilnius	9710na	

0900 UTC - 4AM EST / 3AM CST / 1AM PST

0900 0926	Czech Rep, Radio Prague	9880eu	9955am
	21745as		
0900 0930	Japan, NHK World/Radio Japan	9625as	
	9825pa	11815as	15590as
0900 0957	China, China Radio International	11620as	
	15210pa	15270eu	15350as
	17570eu	17690pa	17750as
0900 1000	Anguilla, Worldwide Univ Network	6090am	
0900 1000	Australia, ABC NT Alice Springs	2310do	
	4835do		
0900 1000	Australia, ABC NT Katherine	2485do	
0900 1000	Australia, ABC NT Tennant Creek	2325do	
0900 1000	Australia, CVC International	15230as	
0900 1000	Australia, Radio Australia	9475va	9580va
	9590va	9710as	11880as
	12080as	15415as	11945pa
0900 1000	Bhutan, Bhutan Broadcasting Svc	6035as	
0900 1000	Canada, CFVP Calgary AB	6030na	
0900 1000	Canada, CKZN St John's NF	6160na	
0900 1000	Canada, CKZU Vancouver BC	6160na	
0900 1000	Costa Rica, Worldwide Univ Network	5030va	
	6150va	7375va	9725va
	13750va		11870va
0900 1000	Germany, Deutsche Welle	15340as	17705as
0900 1000	Guyana, Voice of Guyana	3291do	
0900 1000	Malaysia, RTM/Traxx FM	7295as	
0900 1000	Netherlands, R Netherlands Worldwide	9795as	
0900 1000	New Zealand, Radio NZ International	9765pa	
0900 1000 DRM	New Zealand, Radio NZ International	9870pa	
0900 1000	Nigeria, Radio Nigeria/Kaduna	4770do	
0900 1000	Nigeria, Voice of Nigeria/Lagos	9690af	
0900 1000 vl	Papua New Guinea, R East New Britain	3385do	
0900 1000 vl	Papua New Guinea, Wantok R. Light	7325va	
0900 1000 vl	Saudi Arabia, BSKSA	15250af	
0900 1000 vl	Solomon Islands, SIBC	5020do	
0900 1000	South Africa, Channel Africa	9625af	
0900 1000	UK, BBC World Service	6190af	6195as
	9740as	9860af	11760me
	15400af	15575as	17640af
	17790as	17830af	21470af
0900 1000	Ukraine, R Ukraine International	11550eu	
0900 1000	USA, Armed Forces Radio Network	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
0900 1000	USA, KWHR Naalehu HI	9930as	
0900 1000	USA, WBCQ Monticello ME	5110am	
0900 1000	USA, WBOH Newport NC	5920am	
0900 1000	USA, WEWN Vandiver AL	9355as	
0900 1000	USA, WHRI Cypress Creek SC	7385am	5875na
0900 1000	USA, WRMI Miami FL	9955am	
0900 1000	USA, WTJC Newport NC	9370na	
0900 1000	USA, WWCN Nashville TN	5070na	5890na
	5935na	9985na	
0900 1000	USA, WWRB Manchester TN	3185va	
0900 1000	USA, WYFR/Family Radio Worldwide	5985na	
	6915na	9465as	9755ca
0900 1000 vl	Vanuatu, Radio Vanatu	3945af	7260do
0900 1000	Zambia, CVC Intl/Christian Voice	6065af	
	13590af		
0905 1000 Sun	Greece, Voice of Greece	9420eu	15605eu
0930 1000 Sun	Italy, IRRS	9510va	

1000 UTC - 5AM EST / 4AM CST / 2AM PST

1000 1030	Vietnam, Voice of Vietnam	9840as	12020as
1000 1057	China, China Radio International	6040na	
	11610as	11635as	13590as
	13720as	15190as	15210pa
	15390as	17490eu	17690pa

1000 1057	Netherlands, R Netherlands Worldwide	5955eu	
	11895as	12065as	13820as
1000 1058	New Zealand, Radio NZ International	9765pa	
1000 1100	Anguilla, Worldwide Univ Network	11775am	
1000 1100	Australia, ABC NT Alice Springs	2310do	
	4835do		
1000 1100	Australia, ABC NT Katherine	2485do	
1000 1100	Australia, ABC NT Tennant Creek	2325do	
1000 1100	Australia, CVC International	15230as	
1000 1100	Australia, Radio Australia	9580as	9590va
	9710as	11880as	11945pa
	15415as		
1000 1100	Canada, CFVP Calgary AB	6030na	
1000 1100	Canada, CKZN St John's NF	6160na	
1000 1100	Canada, CKZU Vancouver BC	6160na	
1000 1100	Costa Rica, Worldwide Univ Network	5030va	
	6150va	7375va	9725va
	13750va		11870va
1000 1100	Guyana, Voice of Guyana	3291do	
1000 1100	India, All India Radio	7270as	13695pa
	15020as	15260as	15410as
	17800as	17895pa	
1000 1100	Indonesia, Voice of Indonesia	9526va	11784al
1000 1100 Sun	Italy, IRRS	9510va	
1000 1100	Malaysia, RTM/Traxx FM	7295as	
1000 1100 DRM	New Zealand, Radio NZ International	9870pa	
1000 1100	Nigeria, Radio Nigeria/Kaduna	4770do	
1000 1100	Nigeria, Voice of Nigeria/Lagos	9690af	
1000 1100	North Korea, Voice of Korea	11710am	11735as
	13650as	15180am	
1000 1100 vl	Papua New Guinea, R East New Britain	3385do	
1000 1100 vl	Papua New Guinea, Wantok R. Light	7325va	
1000 1100	Saudi Arabia, BSKSA	15250af	
1000 1100 vl	Solomon Islands, SIBC	5020do	
1000 1100	South Africa, Channel Africa	9625af	
1000 1100	UK, BBC World Service	6195as	9740as
	11760me	15575as	17640af
	17790as	21470af	21660as
1000 1100 Sat/Sun	UK, BBC World Service	15400af	17830af
1000 1100	USA, Armed Forces Radio Network	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1000 1100	USA, KNLS Anchor Point AK	6890as	
1000 1100	USA, KWHR Naalehu HI	9930as	
1000 1100	USA, WBCQ Monticello ME	5110am	
1000 1100	USA, WBOH Newport NC	5920am	
1000 1100	USA, WEWN Vandiver AL	9355as	
1000 1100	USA, WHRI Cypress Creek SC	7385am	
	9425am		
1000 1100	USA, WINB Red Lion PA	9265am	
1000 1100	USA, WRMI Miami FL	9955am	
1000 1100	USA, WTJC Newport NC	9370na	
1000 1100	USA, WWCN Nashville TN	5070na	5890na
	5935na	15825na	
1000 1100	USA, WWRB Manchester TN	3185va	
1000 1100	USA, WYFR/Family Radio Worldwide	5940na	
	5985na	6915na	9465as
	9755ca		6065af
1000 1100	Zambia, CVC Intl/Christian Voice	6065af	
	13590af		
1015 1045 Sun	UK, Bible Voice BC	5985as	
1030 1057	Czech Rep, Radio Prague	9880eu	11665eu
1030 1100	Guam, KSDA/ Adventist World Radio	11780as	
1030 1100	Iran, Voice of the Islamic Rep of Iran	15600as	
	17600as		
1030 1100	Mongolia, Voice of Mongolia	12085as	
1059 1100	New Zealand, Radio NZ International	13840pa	

1100 UTC - 6AM EST / 5AM CST / 3AM PST

1100 1105	Pakistan, Radio Pakistan	15100as	17835as
1100 1127	Iran, Voice of the Islamic Rep of Iran	15600as	
	17600as		
1100 1130	UK, BBC World Service	15400af	
1100 1130	Vietnam, Voice of Vietnam	7285as	
1100 1145	USA, WYFR/Family Radio Worldwide	9550sa	
	9755ca		
1100 1157	China, China Radio International	5955as	
	6040na	11650as	11660as
	11795as	13590as	13620eu
	13645as	17490eu	
1100 1158 DRM	New Zealand, Radio NZ International	9870pa	
1100 1200	Anguilla, Worldwide Univ Network	11775am	
1100 1200	Australia, ABC NT Alice Springs	2310do	
	4835do		
1100 1200	Australia, ABC NT Katherine	2485do	
1100 1200	Australia, ABC NT Tennant Creek	2325do	
1100 1200	Australia, CVC International	15635as	
1100 1200 DRM	Australia, Radio Australia	5995pa	

1100	1200	Australia, Radio Australia	5995va	6020va
		9475as	9560as	9590va
		11945pa	12080as	11880as
1100	1200	Sat/Sun	Canada, CBC NQ SW Service	9625na
1100	1200		Canada, CFVP Calgary AB	6030na
1100	1200		Canada, CKZN St John's NF	6160na
1100	1200		Canada, CKZU Vancouver BC	6160na
1100	1200		Costa Rica, Worldwide Univ Network	5030va
			6150va	7375va
			9725va	11870va
			13750va	
1100	1200	Sun	Italy, IRRS	9510va
1100	1200		Malaysia, RTM/Traxx FM	7295as
1100	1200		New Zealand, Radio NZ International	13840pa
1100	1200		Nigeria, Radio Nigeria/Kaduna	4770do
1100	1200		Nigeria, Voice of Nigeria/Lagos	9690af
1100	1200	vl	Papua New Guinea, R East New Britain	3385do
1100	1200	vl	Papua New Guinea, Wantok R. Light	7325va
1100	1200		Saudi Arabia, BSKSA	15250af
1100	1200	vl	Solomon Islands, SIBC	5020do
1100	1200		South Africa, Channel Africa	9625af
1100	1200		Taiwan, R Taiwan International	7445as
1100	1200		UK, BBC World Service	6190af
			9740as	9860af
			11760me	15310as
			15340as	15575as
			17640af	17760as
			17790as	17830af
			21470af	
1100	1200		Ukraine, R Ukraine International	11550eu
1100	1200		USA, Armed Forces Radio Network	4319usb
			5446usb	5765usb
			6350usb	7811usb
			10320usb	12133usb
			13362usb	
1100	1200		USA, KWHR Naalehu HI	9930as
1100	1200		USA, WBCQ Monticello ME	5110am
1100	1200		USA, WBOH Newport NC	5920am
1100	1200		USA, WEWN Vandiver AL	11560as
1100	1200		USA, WHRI Cypress Creek SC	7385am
			9425am	
1100	1200		USA, WINB Red Lion PA	9265am
1100	1200		USA, WRMI Miami FL	9955am
1100	1200		USA, WTJC Newport NC	9370na
1100	1200		USA, WWCN Nashville TN	5935na
			9980na	15825na
			3185va	
1100	1200		USA, WWRB Manchester TN	3185va
1100	1200		USA, WYFR/Family Radio Worldwide	5950na
			5985na	7730sa
			9625sa	
1100	1200		Zambia, CVC Intl/Christian Voice	6065af
			13590af	
1115	1130		UK, Bible Voice BC	5950as
1130	1200		Bulgaria, Radio Bulgaria	11700eu
1130	1200		Guam, KSDA/ Adventist World Radio	15460as
1130	1200		Vatican City, Vatican Radio	15595eu
1157	1200		Netherlands, R Netherlands Worldwide	5955eu

1200 UTC - 7AM EST / 6AM CST / 4AM PST

1200	1230	Australia, HCJB Global	15400as
1200	1230	France, Radio France International	17800af
1200	1230	Japan, NHK World/Radio Japan	6120na
		9625as	9695as
		17585eu	
1200	1230	Saudi Arabia, BSKSA	15250af
1200	1245	USA, WYFR/Family Radio Worldwide	5950na
		5985na	
1200	1256	Romania, R Romania International	15220eu
1200	1257	China, China Radio International	5955as
		9460as	9600as
		9645as	9730as
		9760pa	11650as
		11660as	11760pa
		11980as	13645as
		13650eu	13790eu
		17490eu	
1200	1258	New Zealand, Radio NZ International	13840pa
1200	1259	Netherlands, R Netherlands Worldwide	5955eu
1200	1259	Poland, Polish Radio	7330eu
1200	1300	Anguilla, Worldwide Univ Network	11775am
1200	1300	Australia, ABC NT Alice Springs	2310do
		4835do	
1200	1300	Australia, ABC NT Katherine	2485do
1200	1300	Australia, ABC NT Tennant Creek	2325do
1200	1300	Australia, CVC International	13635as
1200	1300	Australia, Radio Australia	6020va
		9560pa	9580va
		9590va	11880as
		11945pa	
1200	1300	DRM	Australia, Radio Australia
1200	1300	Sat/Sun	Canada, CBC NQ SW Service
1200	1300		Canada, CFVP Calgary AB
1200	1300		Canada, CKZN St John's NF
1200	1300		Canada, CKZU Vancouver BC
1200	1300		Costa Rica, Worldwide Univ Network
			11870va
			13750va
1200	1300	vl	Germany, Adventist World Radio Europe
1200	1300	Sun	Latvia, Radio SWH
1200	1300		Malaysia, RTM/Traxx FM

1200	1300	Nigeria, Radio Nigeria/Kaduna	4770do
1200	1300	Nigeria, Voice of Nigeria/Lagos	9690af
1200	1300	vl	Papua New Guinea, Wantok R. Light
1200	1300	vl	Solomon Islands, SIBC
1200	1300		5020do
1200	1300		9545al
1200	1300		South Korea, KBS World Radio
1200	1300	f/ DRM	9650na
1200	1300		Taiwan, R Taiwan International
			9850eu
1200	1300		UK, BBC World Service
			6190af
			6195as
			9740as
			9860af
			11750as
			11760me
			15310as
			15575as
			17640af
			17790as
			17830af
			21470af
1200	1300		USA, Armed Forces Radio Network
			4319usb
			5446usb
			5765usb
			6350usb
			7811usb
			10320usb
			12133usb
			13362usb
1200	1300		USA, KNLS Anchor Point AK
1200	1300		7355as
1200	1300		9780as
1200	1300		USA, KWHR Naalehu HI
			12130as
1200	1300		USA, Voice of America
			6140va
			9360va
			9645va
			9760va
			12075va
1200	1300		USA, WBCQ Monticello ME
1200	1300		9330am
1200	1300		USA, WBOH Newport NC
1200	1300		5920am
1200	1300		USA, WEWN Vandiver AL
1200	1300		11560as
1200	1300	Sat/Sun	USA, WHRA Greenbush ME
1200	1300	mtwhf	15710va
1200	1300		USA, WHRI Cypress Creek SC
1200	1300		9410na
1200	1300		USA, WHRI Cypress Creek SC
1200	1300		7385am
1200	1300		USA, WINB Red Lion PA
1200	1300		13570am
1200	1300		USA, WRMI Miami FL
1200	1300		9955am
1200	1300		USA, WTJC Newport NC
1200	1300		9370na
1200	1300		USA, WWCN Nashville TN
			7490na
			9980na
			13845na
			15825na
1200	1300		USA, WWRB Manchester TN
1200	1300		3185va
1200	1300		USA, WYFR/Family Radio Worldwide
			11520as
			11560as
			17555sa
			17795ca
1200	1300		Zambia, CVC Intl/Christian Voice
			6065af
			13590af
1215	1300		Egypt, Radio Cairo
			17835as
1228	1300	vl	Vatican City, Vatican Radio
			11850as
1230	1300	mtwhfa	Australia, HCJB Global
1230	1300		15540as
1230	1300		Bangladesh, Bangla Betar
1230	1300		7250as
1230	1300		Sweden, Radio Sweden
1230	1300		15240na
1230	1300		Thailand, Radio Thailand World Svc
1230	1300		9835va
1230	1300		Turkey, Voice of Turkey
1230	1300		13685va
1230	1300		15450eu
1230	1300		Vietnam, Voice of Vietnam
1230	1300		9840as
1245	1300	Sat	UK, Bible Voice BC
			5950as

1300 UTC - 8AM EST / 7AM CST / 5AM PST

1300	1325	Turkey, Voice of Turkey	13685pa
1300	1329	Czech Rep, Radio Prague	13580eu
1300	1330	Australia, HCJB Global	15540as
1300	1330	Egypt, Radio Cairo	17835af
1300	1330	Slovakia, Universal Life	15750as
1300	1357	China, China Radio International	5955as
		9570na	9650na
		9730as	9760pa
		9765as	9870as
		11660as	11660pa
		11980as	13610eu
		13755as	13790eu
		15260na	15440as
1300	1400	Anguilla, Worldwide Univ Network	11775am
1300	1400	Australia, CVC International	13635as
1300	1400	Australia, Radio Australia	6020va
		9560as	
		9580va	9590va
1300	1400	DRM	Australia, Radio Australia
1300	1400	Sat/Sun	Canada, CBC NQ SW Service
1300	1400		Canada, CFVP Calgary AB
1300	1400		Canada, CKZN St John's NF
1300	1400		Canada, CKZU Vancouver BC
1300	1400		Costa Rica, Worldwide Univ Network
			9725va
			11870va
			13750va
1300	1400		Indonesia, Voice of Indonesia
1300	1400		9526va
1300	1400		11784al
1300	1400		Malaysia, RTM/Traxx FM
1300	1400		7295as
1300	1400		New Zealand, Radio NZ International
1300	1400		6170pa
1300	1400		Nigeria, Radio Nigeria/Kaduna
1300	1400		4770do
1300	1400		Nigeria, Voice of Nigeria/Lagos
			9690af
			9335am
			11710na
			13760eu
			15245eu
1300	1400	vl	Papua New Guinea, Wantok R. Light
1300	1400	vl	Solomon Islands, SIBC
1300	1400		5020do
1300	1400		9545al
1300	1400		South Korea, KBS World Radio
			9570na
			9770as
1300	1400		UK, BBC World Service
			6190af
			6195as
			9740as
			9860af
			11750as
			11760me
			15310as
			15420af
			15575as
			17640af
			17790as
			21470af
1300	1400		USA, Armed Forces Radio Network
			4319usb
			5446usb
			5765usb
			6350usb
			7811usb
			10320usb
			12133usb
			13362usb
1300	1400	mtwhf	USA, KWHR Naalehu HI
1300	1400	Sat/Sun	USA, KWHR Naalehu HI
1300	1400		9930as
1300	1400		USA, Voice of America
1300	1400		9645va
1300	1400		9760va
1300	1400		USA, WBCQ Monticello ME
			9330am

1300	1400		USA, WBOH Newport NC	5920am	
1300	1400		USA, WEWN Vandiver AL	11560as	
1300	1400	Sat/Sun	USA, WHRA Greenbush ME	15710va	
1300	1400		USA, WHRI Cypress Creek SC	9840na	
			11785am		
1300	1400		USA, WINB Red Lion PA	13570am	
1300	1400		USA, WRMI Miami FL	9955am	
1300	1400		USA, WTJC Newport NC	9370na	
1300	1400		USA, WWCR Nashville TN	7490na	9980na
			13845na	15825na	
1300	1400		USA, WWRB Manchester TN	9285va	
1300	1400		USA, WYFR/Family Radio Worldwide	11560as	
			11820na	11865na	11910na
			17715af	17795ca	17630af
1300	1400	vl	Vatican City, Vatican Radio	11850as	
1300	1400		Zambia, CVC Intl/Christian Voice	6065af	
			13590af		
1305	1320	m	Austria, Radio Austria International	13730eu	
1305	1330	Sat/Sun	Austria, Radio Austria International	13730eu	
1310	1340		Japan, NHK World/Radio Japan	11985as	
1330	1357	fa/DRM	Czech Rep, Radio Prague	9850eu	
1330	1400	mtwhfa	Guam, KSDA/ Adventist World Radio	15275as	
1330	1400		India, All India Radio	9690as	11620as
			13710as		
1330	1400		Laos, National Radio	7145as	
1330	1400		Sweden, Radio Sweden	15735va	
1330	1400		Vietnam, Voice of Vietnam	9840as	12020as
1335	1400	Sat/Sun	Austria, Radio Austria International	13730eu	
1345	1400	hf	Austria, Radio Austria International	13730eu	
1355	1400		Guam, KTW/Trans World Radio	9975as	

1400 UTC - 9AM EST / 8AM CST / 6AM PST

1400	1430	Sun	Australia, HCJB Global	15425as	
1400	1430	mtwhfa	Australia, HCJB Global	15400as	
1400	1430	sw	Germany, Pan American BC	15205as	
1400	1430	mhf	Guam, KTW/Trans World Radio	9975as	
1400	1430	Sun	Italy, IRRS	15725va	
1400	1430		Japan, NHK World/Radio Japan	11705va	
			11985as	13630eu	21560eu
1400	1430		Thailand, Radio Thailand World Svc	9805va	
1400	1430	Sun	United Arab Emirates, FEBA	12025as	
1400	1457		China, China Radio International	5995as	
			9765as	9870as	11675as
			13685af	13710eu	13740na
			17630af		13790eu
1400	1457		Czech Rep, Radio Prague	9955am	
1400	1500		Anguilla, Worldwide Univ Network	11775am	
1400	1500		Australia, CVC International	13635as	
1400	1500		Australia, Radio Australia	5995va	6080va
			7240va	9590va	
1400	1500		Bhutan, Bhutan Broadcasting Svc	6035as	
1400	1500	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1400	1500		Canada, CFVP Calgary AB	6030na	
1400	1500		Canada, CKZN St John's NF	6160na	
1400	1500		Canada, CKZU Vancouver BC	6160na	
1400	1500		Costa Rica, Worldwide Univ Network	9725va	
			11870va	13750va	
1400	1500	DRM	Germany, CVC Intl/Voice Africa	7270eu	
1400	1500		Germany, Overcomer Ministries	6110eu	
			13810va		
1400	1500	tw	Guam, KTW/Trans World Radio	9975as	
1400	1500		India, All India Radio	9690as	11620as
			13710as		
1400	1500		Jordan, Radio Jordan	11690na	
1400	1500		Libya, Voice of Africa	17725af	21695af
1400	1500		Malaysia, RTM/Traxx FM	7295as	
1400	1500		Netherlands, R Netherlands Worldwide	5830as	
			9885as	11835as	
1400	1500		New Zealand, Radio NZ International	6170pa	
1400	1500		Nigeria, Radio Nigeria/Kaduna	4770do	
1400	1500		Nigeria, Voice of Nigeria/Lagos	9690af	
1400	1500		Oman, Radio Oman	15140as	
1400	1500	vl	Papua New Guinea, Wantok R. Light	7325va	
1400	1500	DRM	Russia, Voice of Russia	9750eu	
1400	1500		Russia, Voice of Russia	7165as	7255as
			9625as	9660as	9745as
			15605as	15660as	
1400	1500	vl	Solomon Islands, SIBC	5020do	9545al
1400	1500		UK, BBC World Service	5980as	6190af
			6195as	9740as	112095as
			15310as	17640af	17830af
					21470af
1400	1500	Sat/Sun	UK, Bible Voice BC	15680as	
1400	1500		USA, Armed Forces Radio Network	4319usb	
			5446usb	5765usb	6350usb
			10320usb	12133usb	13362usb
1400	1500		USA, KJES Vado NM	11715na	
1400	1500		USA, KNLS Anchor Point AK	7355as	

1400	1500		USA, KWHR Naalehu HI	9930as	
1400	1500		USA, Voice of America	4930af	6080af
			7430va	9345as	9760va
			15530va	15580af	17530af
1400	1500		USA, WBCQ Monticello ME	9930am	
1400	1500		USA, WBOH Newport NC	5920am	
1400	1500		USA, WEWN Vandiver AL	15855as	
1400	1500	Sat/Sun	USA, WHRA Greenbush ME	15195va	
1400	1500		USA, WHRI Cypress Creek SC	9495na	
			9840na	11785am	
1400	1500		USA, WINB Red Lion PA	13570am	
1400	1500		USA, WRMI Miami FL	9955na	
1400	1500		USA, WTJC Newport NC	9370na	
1400	1500		USA, WWCR Nashville TN	7490na	9980na
			13845na	15825na	
1400	1500		USA, WWRB Manchester TN	9385va	
1400	1500		USA, WYFR/Family Radio Worldwide	11560na	
			11830na	11860as	11910na
			17630af	17715ca	17795ca
1400	1500	vl	Vatican City, Vatican Radio	11850as	
1400	1500		Zambia, CVC Intl/Christian Voice	6065af	
			13590af		
1415	1430	mtwhfa	Germany, Pan American BC	15205as	
1415	1430		Nepal, Radio Nepal	5005as	
1430	1445	Sun	Germany, Pan American BC	15205as	
1430	1459		Vatican City, Vatican Radio	4885eu	7250eu
			9645eu		
1430	1500	mtwhfa	Albania, Radio Tirana	13640na	
1430	1500		Australia, Radio Australia	9475va	11660pa
1430	1500		Ethiopia, Radio Ethiopia	5990af	7110af
			9704af		
1430	1500	Sat	Italy, IRRS	15725va	
1430	1500	f/DRM	South Korea, KBS World Radio	9460eu	
1430	1500		Sweden, Radio Sweden	13820va	13840va
			15240na		

1500 UTC - 10AM EST / 9AM CST / 7AM PST

1500	1510	mtwhfa	Turkmenistan, Turkmen Radio	5015eu	
1500	1528		Vietnam, Voice of Vietnam	7285va	9840va
			12020va		
1500	1530		Guam, KSDA/ Adventist World Radio	11985as	
1500	1530		Nigeria, Radio, National Svc/Abuja	7275do	
1500	1530		UK, BBC World Service	7380af	11860af
			15420af		
1500	1530	Sat/Sun	UK, Sudan Radio Service	9840af	
1500	1530	vl	Venezuela, R Nacional de Venezuela	11680sa	
1500	1545		USA, WYFR/Family Radio Worldwide	15770sa	
1500	1550		New Zealand, Radio NZ International	6170pa	
1500	1550	vl	Vatican City, Vatican Radio	11850as	
1500	1555		South Africa, Channel Africa	15215af	
1500	1557		Canada, R Canada International	11675as	
			17720as		
1500	1557		China, China Radio International	5955as	
			6100af	7160as	7325as
			9870as	11965eu	13640eu
			13740na	17630af	13685af
1500	1557		Netherlands, R Netherlands Worldwide	5830af	
			9885as	11835as	
1500	1600		Anguilla, Worldwide Univ Network	11775am	
1500	1600		Australia, CVC International	13635as	
1500	1600		Australia, Radio Australia	5995va	6080va
			7240as	9475va	9590as
1500	1600	Sat/Sun	Canada, CBC NQ SW Service	9625na	
1500	1600		Canada, CFVP Calgary AB	6030na	
1500	1600		Canada, CKZN St John's NF	6160na	
1500	1600		Canada, CKZU Vancouver BC	6160na	
1500	1600		Costa Rica, Worldwide Univ Network	9725va	
			11870va	13750va	
1500	1600		Finland, Overcomer Ministries	9595me	
1500	1600	vl	Germany, Adventist World Radio Europe	15225as	
1500	1600	DRM	Germany, CVC Intl/Voice Africa	7270eu	
1500	1600		Germany, Overcomer Ministries	6110eu	
			17485af		
1500	1600		Italy, IRRS	9825af	
1500	1600		Jordan, Radio Jordan	11690na	
1500	1600		Libya, Voice of Africa	17725af	21695af
1500	1600		Malaysia, RTM/Traxx FM	7295as	
1500	1600		Myanmar, Myanma Radio	5985as	
1500	1600		Nigeria, Radio Nigeria/Kaduna	4770do	
1500	1600		Nigeria, Voice of Nigeria/Lagos	9690af	
1500	1600		North Korea, Voice of Korea	3560eu	9335na
			11710eu	13760eu	15245eu
1500	1600	vl	Papua New Guinea, Wantok R. Light	7325va	
1500	1600		Russia, Voice of Russia	4965va	9810eu
1500	1600	vl	Slovakia, Miraya FM Radio	15650af	
1500	1600	vl	Solomon Islands, SIBC	5020do	9545al
1500	1600		Uganda, Dunamis Shortwave	4750af	

1500 1600	UK, BBC World Service	5975as	5980as
	6190af	6195as	9740as
	11920as	12095va	15310as
	17640af	17830af	21470af
1500 1600 Sat/Sun	UK, BBC World Service	7380af	15420af
1500 1600	USA, Armed Forces Radio Network	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1500 1600	USA, KJES Vado NM	11715na	
1500 1600	USA, KWHR Naalehu HI	9930as	
1500 1600	USA, Voice of America	6160va	7125va
	7430va	9345as	9695va
	12150va	13570af	15310va
	15550va	15580va	17895af
1500 1600	USA, WBCQ Monticello ME	9930am	
1500 1600	USA, WBOH Newport NC	5920am	
1500 1600	USA, WEWN Vandiver AL	15855as	
1500 1600 Sat/Sun	USA, WHRA Greenbush ME	15195va	
1500 1600	USA, WHRI Cypress Creek SC	9495na	
	9840na	11785am	
1500 1600	USA, WINB Red Lion PA	13570am	
1500 1600	USA, WRMI Miami FL	9955na	
1500 1600	USA, WTJC Newport NC	9370na	
1500 1600	USA, WWCR Nashville TN	7490na	9980na
	13845na	15825na	
1500 1600	USA, WWRB Manchester TN	9385va	
1500 1600	USA, WYFR/Family Radio Worldwide	6280as	
	11830na	11860as	11910na
			17795ca
1500 1600	Zambia, CVC Intl/Christian Voice	6065af	
	13590af		
1505 1520 m	Austria, Radio Austria International	13775na	
1505 1530 Sat/Sun	Austria, Radio Austria International	13775na	
1505 1557	Canada, R Canada International	9515as	
	17720as	11675as	
1515 1530 twhf	Austria, Radio Austria International	13775na	
1515 1545 smtwfhf	Swaziland, Trans World Radio	4760af	
	6065af		
1530 1558	Vatican City, Vatican Radio	13765eu	15235eu
1530 1600	Iran, Voice of the Islamic Rep of Iran	7375as	
	9600as		
1530 1600	Mongolia, Voice of Mongolia	12085as	
1530 1600	Sweden, Radio Sweden	11590va	
1530 1600 Sun	UK, Bible Voice BC	13590me	
1530 1600 ha	UK, Bible Voice BC	15680as	
1530 1600 mtwhf	UK, Sudan Radio Service	9840af	
1535 1600 Sat/Sun	Austria, Radio Austria International	13775na	
1540 1600 mtwhf	UK, Bible Voice BC	13590me	
1545 1600 mtwhf	Austria, Radio Austria International	13775na	
1545 1600 Sat	UK, Bible Voice BC	13590me	
1551 1600 DRM	New Zealand, Radio NZ International	6170pa	
1551 1600	New Zealand, Radio NZ International	7145pa	

1600 UTC - 11AM EST / 10AM CST / 8AM PST

1600 1615	Pakistan, Radio Pakistan	9385va	11565va
	15625af		
1600 1615 twha	UK, Bible Voice BC	13590me	
1600 1627	Czech Rep, Radio Prague	5930eu	17485af
1600 1627	Iran, Voice of the Islamic Rep of Iran	7375as	
	9600as		
1600 1628	Vietnam, Voice of Vietnam	7220va	7280va
	9550va	9730va	
1600 1630 Sun	Germany, Pan American BC	13830me	
1600 1630	Guam, KSDA/ Adventist World Radio	11805as	
	11985as		
1600 1630	Myanmar, Myanma Radio	9730do	
1600 1630	Nigeria, Voice of Nigeria/Lagos	9690af	
1600 1630 Sat/Sun	Swaziland, Trans World Radio	6065af	
1600 1630	Yemen, Rep of Yemen Radio	9780me	
1600 1645	USA, WYFR/Family Radio Worldwide	11830na	
	11865na		
1600 1650 DRM	New Zealand, Radio NZ International	6170pa	
1600 1650	New Zealand, Radio NZ International	7145pa	
1600 1657	Canada, R Canada International	9515as	
1600 1657	China, China Radio International	6100af	
	6180me	9570af	9760me
	11940eu	11965eu	13760eu
1600 1658	Germany, Deutsche Welle	6170as	9540as
	15640as		
1600 1659	Finland, Overcomer Ministries	9595me	
1600 1700	Anguilla, Worldwide Univ Network	11775am	
1600 1700	Australia, CVC International	13635as	
1600 1700	Australia, Radio Australia	5995va	6080va
	7240as	9475va	9710pa
1600 1700 Sat	Canada, CBC NQ SW Service	9625na	
1600 1700	Canada, CFVP Calgary AB	6030na	
1600 1700	Canada, CKZN St John's NF	6160na	
1600 1700	Canada, CKZU Vancouver BC	6160na	

1600 1700 DRM	Canada, R Canada International	9800na	
1600 1700	Costa Rica, Worldwide Univ Network	11870va	
	13750va		
1600 1700	Egypt, Radio Cairo	12170af	
1600 1700	Ethiopia, Radio Ethiopia	7165af	9560af
1600 1700	France, Radio France International	17605af	15605af
	17605af		
1600 1700	Italy, IRRS	9825af	
1600 1700	Malaysia, RTM/Traxx FM	7295as	
1600 1700	Nigeria, Radio Nigeria/Kaduna	4770do	
1600 1700	North Korea, Voice of Korea	9990va	11545va
1600 1700 vl	Papua New Guinea, Wantok R. Light	7325va	
1600 1700	Russia, Voice of Russia	4975me	6070as
	7350as	9405as	9890eu
	12055as	13855va	
1600 1700 vl	Rwanda, Radio Rwanda	6055do	
1600 1700 vl	Slovakia, Miraya FM Radio	15650af	
1600 1700 vl	Solomon Islands, SIBC	5020do	9545al
1600 1700	South Korea, KBS World Radio	9515eu	
1600 1700	Taiwan, R Taiwan International	11550as	
	15515as		
1600 1700	Uganda, Dunamis Shortwave	4750af	
1600 1700	UK, BBC World Service	3255af	5975as
	6190af	9625as	11920as
	15400af	15420af	17640af
	17830af	21470af	17795af
1600 1700 Sat/Sun	UK, BBC World Service	7380af	
1600 1700 fs	UK, Bible Voice BC	13590me	
1600 1700	USA, Armed Forces Radio Network	4319usb	
	5446usb	5765usb	6350usb
	10320usb	12133usb	13362usb
1600 1700	USA, KWHR Naalehu HI	9930as	
1600 1700	USA, Voice of America	4930af	6080af
	12080va	13600va	13615va
	15580af	17895va	15455va
1600 1700	USA, WBCQ Monticello ME	9930am	
1600 1700	USA, WBOH Newport NC	5920am	
1600 1700	USA, WEWN Vandiver AL	15855as	
1600 1700	USA, WHRA Greenbush ME	17520af	
1600 1700	USA, WHRI Cypress Creek SC	9495am	
	9840na	11785am	
1600 1700	USA, WINB Red Lion PA	13570am	
1600 1700	USA, WRMI Miami FL	9955am	
1600 1700	USA, WTJC Newport NC	9370na	
1600 1700	USA, WWCR Nashville TN	9980na	12160na
	13845na	15825na	
1600 1700	USA, WWRB Manchester TN	9385va	12180va
1600 1700 Sun	USA, WWRB Manchester TN	11920af	
1600 1700	USA, WYFR/Family Radio Worldwide	6085ca	
	13695na	17795ca	18980va
	21455va		21525af
1600 1700	Zambia, CVC Intl/Christian Voice	4965af	
	13590af		
1615 1629	Vatican City, Vatican Radio	5885eu	7250eu
	9645eu	15595eu	
1615 1630 h	UK, Bible Voice BC	13590me	
1615 1645 mtwhf	Swaziland, Trans World Radio	6130af	
1615 1700 Sun	UK, BBC World Service	11860af	
1615 1700 ta	UK, Bible Voice BC	13590me	
1630 1645 h	UK, Bible Voice BC	13590me	
1630 1657	Slovakia, R Slovakia International	5920eu	
	6055eu		
1630 1700 vl	Guam, KSDA/ Adventist World Radio	11650as	
1630 1700	Nigeria, Voice of Nigeria/Lagos	15120af	
1630 1700 Sat/Sun	Swaziland, Trans World Radio	6130af	
1630 1700 Sat	UK, BBC World Service	11860af	
1640 1650 mtwhfa	Turkmenistan, Turkmen Radio	4930eu	
1645 1700	Tajikistan, Tajik Radio	7245as	
1651 1700 DRM	New Zealand, Radio NZ International	9890pa	
1651 1700	New Zealand, Radio NZ International	9765pa	

1700 UTC - 12PM EST / 11AM CST / 9AM PST

1700 1705	Canada, R Canada International	9515as	
1700 1705 DRM	Canada, R Canada International	9800na	
1700 1715 t/ vl	UK, Bible Voice BC	13590me	
1700 1720 twhfa	Moldova, Radio PMR/Pridnestrovie	6235eu	
1700 1727	Czech Rep, Radio Prague	5930eu	17485af
1700 1730	Jordan, Radio Jordan	11690na	
1700 1730 DRM	Romania, R Romania International	7460eu	
1700 1730 Sat	UK, Bible Voice BC	13590me	
1700 1730	USA, Voice of America	6080af	11835af
	15580af		
1700 1730 Sat	USA, WRMI Miami FL	9955af	
1700 1740 f	Moldova, Radio PMR/Pridnestrovie	6235eu	
1700 1745	UK, BBC World Service	6005af	9410af
1700 1750 DRM	New Zealand, Radio NZ International	9890pa	
1700 1750	New Zealand, Radio NZ International	9765pa	

1700	1755		South Africa, Channel Africa	15235af	
1700	1756		Romania, R Romania International	11735eu	
1700	1757		China, China Radio International	6100af	
			6145eu 7130as 7265me 7315me		
			7335eu 9570af 9595eu 11900af		
			11940eu 13760eu		
1700	1757	DRM	Netherlands, R Netherlands Worldwide	5955eu	
1700	1759		Poland, Polish Radio	7140eu	7265eu
1700	1800		Anguilla, Worldwide Univ Network	11775am	
1700	1800		Australia, CVC International	13635as	
1700	1800		Australia, Radio Australia	5995va	6080va
			9475as 9580va 9710as		11880as
1700	1800	Sat	Canada, CBC NQ SW Service	9625na	
1700	1800		Canada, CFVP Calgary AB	6030na	
1700	1800		Canada, CKZN St John's NF	6160na	
1700	1800		Canada, CKZU Vancouver BC	6160na	
1700	1800		Costa Rica, Worldwide Univ Network	11870va	
			13750va		
1700	1800		Egypt, Radio Cairo	12170af	
1700	1800		Equatorial Guinea, Radio Africa	15190af	
1700	1800		Italy, IRRS	9825af	
1700	1800		Malaysia, RTM/Traxx FM	7295as	
1700	1800		Nigeria, Radio Nigeria/Kaduna	4770do	
1700	1800		Nigeria, Voice of Nigeria/Lagos	15120af	
1700	1800	vl	Papua New Guinea, Wantok R. Light	7325va	
1700	1800	Sat	Russia, Voice of Russia	9820eu	9890eu
1700	1800		Russia, Voice of Russia	4975me	7350as
			9405as 11510af 11985af		
1700	1800	Sat/Sun	Russia, Voice of Russia	6000eu	7320eu
			7340eu		
1700	1800	vl	Rwanda, Radio Rwanda	6055do	
1700	1800	vl	Slovakia, Miraya FM Radio	15650af	
1700	1800	vl	Solomon Islands, SIBC	5020eu	9545al
1700	1800		Swaziland, Trans World Radio	3200af	
			9500af		
1700	1800		Taiwan, R Taiwan International	11705af	
			15690af		
1700	1800		Uganda, Dunamis Shortwave	4750af	
1700	1800		UK, BBC World Service	3255af	5975as
			6190af 6195va 7380af		9625as
			12095af 13675af 15400af		17795af
			17830af		
1700	1800	fas	UK, Bible Voice BC	9430me	13590me
1700	1800		USA, Armed Forces Radio Network	4319usb	
			5446usb 5765usb 6350usb		7811usb
			10320usb 12133usb 13362usb		
1700	1800		USA, KWHR Naalehu HI	9930as	
1700	1800	Sat/Sun	USA, Voice of America	15675af	
1700	1800		USA, WBCQ Monticello ME	9330am	15420am
1700	1800		USA, WBOH Newport NC	5920am	
1700	1800		USA, WEWN Vandiver AL	15855as	
1700	1800		USA, WHRA Greenbush ME	17520af	
1700	1800		USA, WHRI Cypress Creek SC	9495am	
			9840na 11785am		
1700	1800		USA, WINB Red Lion PA	13570am	
1700	1800		USA, WRMI Miami FL	9955am	
1700	1800		USA, WTJC Newport NC	9370na	
1700	1800		USA, WWCR Nashville TN	9980na	12160na
			13845na 15825na		
1700	1800	Sun	USA, WWRB Manchester TN	11920af	
1700	1800		USA, WWRB Manchester TN	9385va	12180va
1700	1800		USA, WYFR/Family Radio Worldwide	13690na	
			17795ca 18980ca 21455va		
1700	1800		Zambia, CVC Intl/Christian Voice	4965af	
			13590af		
1720	1740	Sat/Sun	USA, Voice of America	4930af	11605af
			13755af 15775af		
1730	1757		Vatican City, Vatican Radio	11625af	12765af
			15570af		
1730	1800		Bulgaria, Radio Bulgaria	7200eu	9400eu
1730	1800		Guam, KSDA/ Adventist World Radio	9980as	
1730	1800		Swaziland, Trans World Radio	9500af	
1730	1800	whf	Sweden, Radio Sweden	6065va	
1730	1800	mtwhf	UK, Sudan Radio Service	9840af	
1730	1800		USA, Voice of America	5980va	5995va
			6080af 9570va 11605va		15410af
			15580af		
1730	1800	mtwhf	USA, Voice of America	4930af	11605af
			15775af		
1745	1800		Bangladesh, Bangla Betar	7250as	
1745	1800		India, All India Radio	7410eu	9445af
			9950eu 11620eu 11935af		13605af
			15075af 15155af 17670af		
1751	1800	DRM	New Zealand, Radio NZ International	11675pa	
1751	1800		New Zealand, Radio NZ International	11725pa	

1800 UTC - 1PM EST / 12PM CST / 10AM PST

1800	1809		Tanzania, Tanzania Broadcasting Corp	11735af	
1800	1815	Sun	UK, Bible Voice BC	13590me	
1800	1815	Sat	UK, Bible Voice BC	11875me	
1800	1828		Vietnam, Voice of Vietnam	9765eu	
1800	1830	w	Austria, Adventist World Radio Europe	15315af	
1800	1830		Nigeria, Radio, National Svc/Abuja	7275do	
1800	1830		South Africa, AWR Africa	3215af	3345af
			9610af		
1800	1830		UK, BBC World Service	5975as	
1800	1830	Sat	UK, Bible Voice BC	9430me	13590me
1800	1830	Sun	UK, Bible Voice BC	6130eu	
1800	1830		USA, Voice of America	6080af	15410af
			15580af 17865af		
1800	1845	Sat	UK, Bible Voice BC	6130eu	
1800	1857		China, China Radio International	7120eu	
			9600eu 13760eu		
1800	1857		Netherlands, R Netherlands Worldwide	6020af	
			11660af 15535af		
1800	1859		Canada, R Canada International	9530af	
			11765af 17735af 17810af		
1800	1900		Anguilla, Worldwide Univ Network	11775am	
1800	1900	mtwhf	Argentina, RAE	9690al	15345 irr
1800	1900		Australia, Radio Australia	6080va	7240as
			9475va 9580as 9710as		11880as
1800	1900		Bangladesh, Bangla Betar	7250eu	
1800	1900		Canada, CFVP Calgary AB	6030na	
1800	1900		Canada, CKZN St John's NF	6160na	
1800	1900		Canada, CKZU Vancouver BC	6160na	
1800	1900		Costa Rica, Worldwide Univ Network	11870va	
			13750va		
1800	1900		Equatorial Guinea, Radio Africa	15190af	
1800	1900		India, All India Radio	7410eu	9445af
			9950eu 11620eu 11935af		13605af
			15075af 15155af 17670af		
1800	1900	fas	Italy, IRRS	7290va	
1800	1900		Kuwait, Radio Kuwait	11990va	
1800	1900		Malaysia, RTM/Traxx FM	7295as	
1800	1900		Netherlands, R Netherlands Worldwide	7395af	
1800	1900	DRM	New Zealand, Radio NZ International	11675pa	
1800	1900		New Zealand, Radio NZ International	11725pa	
1800	1900		Nigeria, Radio Nigeria/Kaduna	4770do	
1800	1900		Nigeria, Voice of Nigeria/Lagos	15120af	
1800	1900		North Korea, Voice of Korea	3560eu	13760eu
1800	1900	vl	Papua New Guinea, Wantok R. Light	7325va	
1800	1900		Russia, Voice of Russia	9480eu	9745af
			9850af 9890eu		
1800	1900	vl	Rwanda, Radio Rwanda	6055do	
1800	1900	vl	Solomon Islands, SIBC	5020do	9545al
1800	1900		South Korea, KBS World Radio	7275eu	
1800	1900		Swaziland, Trans World Radio	3200af	
			9500af		
1800	1900		Taiwan, R Taiwan International	3965eu	
1800	1900		Uganda, Dunamis Shortwave	4750af	
1800	1900		UK, BBC World Service	3255af	5895va
			5995as 6190af 6195va		7380af
			9485as 12095af 13675va		15400af
			17795af 17830af		
1800	1900	DRM	UK, BBC World Service	5875eu	
1800	1900	Sun	UK, Bible Voice BC	9430me	
1800	1900		USA, Armed Forces Radio Network	4319usb	
			5446usb 5765usb 6350usb		7811usb
			10320usb 12133usb 13362usb		
1800	1900		USA, WBCQ Monticello ME	7415am	9330am
			15420am		
1800	1900		USA, WBOH Newport NC	5920am	
1800	1900		USA, WEWN Vandiver AL	15855as	
1800	1900		USA, WHRA Greenbush ME	17690af	
1800	1900	mtwhf	USA, WHRI Cypress Creek SC	17520af	
1800	1900	Sat/Sun	USA, WHRI Cypress Creek SC	9495am	
1800	1900		USA, WHRI Cypress Creek SC	9840na	
			11785am		
1800	1900		USA, WINB Red Lion PA	13570am	
1800	1900		USA, WRMI Miami FL	9955am	
1800	1900		USA, WTJC Newport NC	9370na	
1800	1900		USA, WWCR Nashville TN	9980na	12160na
			13845na 15825na		
1800	1900	Sun	USA, WWRB Manchester TN	11920af	
1800	1900		USA, WWRB Manchester TN	9385va	12180va
1800	1900		USA, WYFR/Family Radio Worldwide	6180va	
			13615na 13690na 17795ca		17845af
			18980va		
1800	1900		Yemen, Rep of Yemen Radio	9780me	
1800	1900		Zambia, CVC Intl/Christian Voice	4965af	
			13590af		
1820	1840	Sat/Sun	USA, Voice of America	4930af	11605af
			15775af		

1830	1857	Slovakia, R Slovakia International	5920eu	
		6055eu		
1830	1900	Turkey, Voice of Turkey	9785eu	
1830	1900	UK, BBC World Service	6005af	9410af
1830	1900 f	UK, Bible Voice BC	9430me	
1830	1900 Sun	UK, Bible Voice BC	6130eu	
1830	1900	USA, Voice of America	4930af	6080af
		9820va	9520va	9885af
		11805va	15410af	11755va
				15580af
1845	1900 mtwhfa	Albania, Radio Tirana	7430eu	13640eu
1845	1900 Sun	UK, Bible Voice BC	11830af	

1900 UTC - 2PM EST / 1PM CST / 11AM PST

1900	1925	Turkey, Voice of Turkey	9785eu	
1900	1928	Vietnam, Voice of Vietnam	7280va	9730va
1900	1930	Germany, Deutsche Welle	9565af	11795af
		17860af		
1900	1930 Sun	UK, Bible Voice BC	6130eu	13710af
1900	1930 mtwhf	USA, Voice of America	11605af	15775af
1900	1945	India, All India Radio	7410eu	9445af
		9950eu	11620eu	11935af
			15075af	15155af
				17670af
1900	1945	USA, WYFR/Family Radio Worldwide	6085ca	
1900	1950	New Zealand, Radio NZ International	11725pa	
1900	1950	New Zealand, Radio NZ International	11675pa	
1900	1957	China, China Radio International	7295va	
		9435va		
1900	1957	Netherlands, R Netherlands Worldwide	5905af	
		7425af	11660af	15335af
				15535af
1900	2000	Anguilla, Worldwide Univ Network	11775am	
1900	2000	Australia, Radio Australia	6080va	7240as
		9500va	9580va	9710as
				11880as
1900	2000	Canada, CFVP Calgary AB	6030na	
1900	2000	Canada, CKZN St John's NF	6160na	
1900	2000	Canada, CKZU Vancouver BC	6160na	
1900	2000	Costa Rica, Worldwide Univ Network	11870va	
		13750va		
1900	2000	Egypt, Radio Cairo	9300af	
1900	2000	Equatorial Guinea, Radio Africa	15190af	
1900	2000	Finland, Overcomer Ministries	6060eu	
1900	2000	Germany, Overcomer Ministries	6175eu	
1900	2000 fas	Italy, IRRS	7290va	
1900	2000	Kuwait, Radio Kuwait	11990va	
1900	2000	Malaysia, RTM/Traxx FM	7295as	
1900	2000	Netherlands, R Netherlands Worldwide	7395af	
1900	2000	Nigeria, Radio Nigeria/Kaduna	4770do	
1900	2000	Nigeria, Voice of Nigeria/Lagos	15120af	
1900	2000	North Korea, Voice of Korea	7100af	9975va
		11535va	11910af	
1900	2000 vl	Papua New Guinea, Wantok R. Light	7325va	
1900	2000	Russia, Voice of Russia	7310eu	7195eu
		7310eu		
1900	2000 vl	Rwanda, Radio Rwanda	6055do	
1900	2000 vl	Solomon Islands, SIBC	5020do	
1900	2000	South Africa, SA Radio League	3215af	
1900	2000 mtwhf	Spain, Radio Exterior Espana	9665eu	11620af
1900	2000	Swaziland, Trans World Radio	3200af	
		9500af		
1900	2000	Thailand, Radio Thailand World Svc	7155eu	
1900	2000 vl	Uganda, UBC Radio	4976do	5026do
1900	2000	UK, BBC World Service	3255af	5875va
		5995as	6005af	6190af
		9485as	12095af	15400af
				17795af
				17830af
1900	2000	UK, BBC World Service	5875eu	
1900	2000	Ukraine, R Ukraine International	7490eu	
1900	2000	USA, Armed Forces Radio Network	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12133usb	13362usb
1900	2000	USA, KJES Vado NM	15385na	
1900	2000	USA, Voice of America	4930af	6080af
		7480va	9670va	9885af
		15580af	17895af	15410af
1900	2000	USA, WBCQ Monticello ME	7415am	9330am
		15420am		
1900	2000	USA, WBOH Newport NC	5920am	
1900	2000	USA, WEWN Vandiver AL	17595af	
1900	2000	USA, WHRA Greenbush ME	17690af	
1900	2000	USA, WHRI Cypress Creek SC	9495am	
1900	2000	USA, WHRI Cypress Creek SC	11785am	
1900	2000	USA, WINB Red Lion PA	13570am	
1900	2000	USA, WRMI Miami FL	9955am	
1900	2000	USA, WTJC Newport NC	9370na	
1900	2000	USA, WWCN Nashville TN	9980na	12160na
		13845na	15825na	
1900	2000	USA, WWRB Manchester TN	9385va	12180va
1900	2000	USA, WYFR/Family Radio Worldwide	3230af	

		9775af	11775eu	13695na	13690ca
		17795af	17845eu	18930eu	18980va
1900	2000	Zambia, CVC Intl/Christian Voice			4965af
		13590af			
1930	2000 fas	Germany, Pan American BC	9515af		
1930	2000	Iran, Voice of the Islamic Rep of Iran	6205eu		
		7205eu	7260af	9800af	9925af
1945	2000	Vatican City, Vatican Radio	9800na		
1950	2000	Vatican City, Vatican Radio	5885eu		7250eu
		9645eu			
1951	2000	New Zealand, Radio NZ International	15720pa		
1951	2000	New Zealand, Radio NZ International	17675pa		

2000 UTC - 3PM EST / 2PM CST / 12PM PST

2000	2015 Sun	Germany, Pan American BC	9515af	
2000	2019	Vatican City, Vatican Radio	5885eu	7250eu
		9645eu		
2000	2019	Vatican City, Vatican Radio	9800na	
2000	2027	Czech Rep, Radio Prague	5930eu	11600pa
2000	2027	Iran, Voice of the Islamic Rep of Iran	6205eu	
		7205eu	7260af	9800af
				9925af
2000	2027	Vatican City, Vatican Radio	7365af	9755af
		11625af		
2000	2030 mtwhfa	Albania, Radio Tirana	7465eu	13600na
2000	2030	China, China Radio International	7160eu	
2000	2030	Egypt, Radio Cairo	9300af	
2000	2030 fa	Germany, Pan American BC	9515af	
2000	2030	South Africa, AWR Africa	9655af	
2000	2030	USA, Voice of America	4930af	4940af
		6080af	15580af	17895af
2000	2045	Swaziland, Trans World Radio	3200af	
2000	2045	USA, WYFR/Family Radio Worldwide	17750eu	
2000	2057	China, China Radio International	5960eu	
		5985af	7190eu	7285eu
		9440va	9660eu	7295va
2000	2057	Germany, Deutsche Welle	6150af	11795af
		11865af	15205af	
2000	2057	Netherlands, R Netherlands Worldwide	5905af	
		7425af	17810af	
2000	2059	Canada, R Canada International	11765af	
		13650af	15235af	17735af
2000	2059	Finland, Overcomer Ministries	6060eu	
2000	2100	Anguilla, Worldwide Univ Network	11775am	
2000	2100	Australia, ABC NT Alice Springs	2310do	
		4835do		
2000	2100	Australia, ABC NT Katherine	2485do	
2000	2100	Australia, ABC NT Tennant Creek	2325do	
2000	2100 Sat/Sun	Australia, Radio Australia	6080va	7240as
		12080as		
2000	2100	Australia, Radio Australia	9500va	11650as
		11660pa	11880as	
2000	2100	Belarus, Radio Minsk	7105eu	7360eu
		7390eu		
2000	2100	Canada, CFVP Calgary AB	6030na	
2000	2100	Canada, CKZN St John's NF	6160na	
2000	2100	Canada, CKZU Vancouver BC	6160na	
2000	2100	Costa Rica, Worldwide Univ Network	13750va	
2000	2100	Equatorial Guinea, Radio Africa	15190af	
2000	2100	Germany, Overcomer Ministries	5995eu	
		6175eu		
2000	2100	Kuwait, Radio Kuwait	11990va	
2000	2100 vl	Liberia, ELWA	4760do	
2000	2100	Malaysia, RTM/Traxx FM	7295as	
2000	2100	Netherlands, R Netherlands Worldwide	6020af	
2000	2100	New Zealand, Radio NZ International	17675pa	
2000	2100	New Zealand, Radio NZ International	15720pa	
2000	2100	Nigeria, Radio Nigeria/Kaduna	4770do	
2000	2100	Nigeria, Voice of Nigeria/Lagos	15120af	
2000	2100 vl	Papua New Guinea, R East New Britain	3385do	
2000	2100 vl	Papua New Guinea, Wantok R. Light	7325va	
2000	2100	Russia, Voice of Russia	7195eu	9890eu
2000	2100 vl	Rwanda, Radio Rwanda	6055do	
2000	2100	South Africa, Channel Africa	3345af	
2000	2100	Spain, Radio Exterior Espana	9665eu	11620af
2000	2100 mtwhf	Uganda, UBC Radio	4976do	5026do
2000	2100 vl	UK, BBC World Service	3255af	5875va
		6005af	6190af	9410af
		13820af	15400af	17830af
2000	2100	UK, BBC World Service	5875eu	
2000	2100	USA, Armed Forces Radio Network	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12133usb	13362usb
2000	2100	USA, WBCQ Monticello ME	7415am	9330am
		15420am		
2000	2100	USA, WBOH Newport NC	5920am	
2000	2100	USA, WEWN Vandiver AL	17595af	
2000	2100	USA, WHRA Greenbush ME	17690af	
2000	2100	USA, WHRI Cypress Creek SC	9495am	
2000	2100	USA, WHRI Cypress Creek SC	11785am	
2000	2100	USA, WINB Red Lion PA	13570am	
2000	2100	USA, WRMI Miami FL	9955am	
2000	2100	USA, WTJC Newport NC	9370na	
2000	2100	USA, WWCN Nashville TN	9980na	12160na
		13845na	15825na	
2000	2100	USA, WWRB Manchester TN	9385va	12180va
2000	2100	USA, WYFR/Family Radio Worldwide	3230af	

2000	2100	Sat/Sun	USA, WHRA Greenbush ME	11885va	
2000	2100	f	USA, WHRI Cypress Creek SC	17650am	
2000	2100	asmtwh	USA, WHRI Cypress Creek SC	9495am	
2000	2100		USA, WINB Red Lion PA	13570am	
2000	2100		USA, WRMI Miami FL	9955am	
2000	2100		USA, WTJC Newport NC	9370na	
2000	2100		USA, WWCR Nashville TN	9980na	12160na
			13845na	15825na	
2000	2100	Sun	USA, WWRB Manchester TN	11920af	
2000	2100		USA, WWRB Manchester TN	9385va	12180va
2000	2100		USA, WYFR/Family Radio Worldwide	7430eu	
			9485af	9625af	9635af
			13625af	17725sa	17795ca
			18910va		17845af
2000	2100		Zambia, CVC Intl/Christian Voice	4965af	
			13590af		
2005	2100		Syria, Radio Damascus	9330eu	
2030	2045		Thailand, Radio Thailand World Svc	9680eu	
2030	2056		Romania, R Romania International	9515eu	
			11940na	15465na	
2030	2058		Vietnam, Voice of Vietnam	7220va	7280va
			9550va	9730va	
2030	2100		Cuba, Radio Havana Cuba	9505va	11760va
2030	2100		Netherlands, R Netherlands Worldwide	7395af	
2030	2100		Sweden, Radio Sweden	7395va	
2030	2100		Turkey, Voice of Turkey	7170va	
2030	2100		USA, Voice of America	4930af	6080af
			7555as	15580af	17895af
2030	2100	Sat/Sun	USA, Voice of America	11720af	
2045	2100		India, All India Radio	7410eu	9445eu
			9910pa	9950eu	11620va
					11715pa

2100 UTC - 4PM EST / 3PM CST / 1PM PST

2100	2125		Turkey, Voice of Turkey	7170pa	
2100	2127		China, China Radio International	11640af	
			13630af		
2100	2130		Australia, ABC NT Katherine	2485do	
2100	2130		Australia, ABC NT Tennant Creek	2325do	
2100	2130		Austria, Adventist World Radio Europe	11955af	
2100	2130	Sat	Canada, CBC NQ SW Service	9625na	
2100	2130		Cuba, Radio Havana Cuba	9505va	11760va
2100	2130		Nigeria, Radio, National Svc/Abuja	7275do	
2100	2130		South Africa, AWR Africa	11955af	
2100	2130		South Korea, KBS World Radio	3955eu	
2100	2145		USA, WYFR/Family Radio Worldwide	13615na	
			13690na	17795ca	18980va
2100	2157		China, China Radio International	5960eu	
			6135eu	7190eu	7285eu
			9600eu		7325af
2100	2200		Angola, Radio Nacional de Angola	7217do	
2100	2200		Anguilla, Worldwide Univ Network	11775am	
2100	2200		Australia, ABC NT Alice Springs	2310do	
			4835do		
2100	2200		Australia, Radio Australia	9500as	9660as
			11650pa	11660pa	11695as
			13630as	15515as	12080as
2100	2200		Belarus, Radio Minsk	7105eu	7390eu
2100	2200		Bulgaria, Radio Bulgaria	5900eu	9700eu
2100	2200		Canada, CFVP Calgary AB	6030na	
2100	2200		Canada, CKZN St John's NF	6160na	
2100	2200		Canada, CKZU Vancouver BC	6160na	
2100	2200		Costa Rica, Worldwide Univ Network	13750va	
2100	2200		Equatorial Guinea, Radio Africa	15190af	
2100	2200		Germany, Deutsche Welle	9735af	11865af
			15205af		
2100	2200		Germany, Overcomer Ministries	5995eu	
2100	2200		Guyana, Voice of Guyana	3291do	
2100	2200		India, All India Radio	7410eu	9445eu
			9950pa	11620eu	
2100	2200	vl	Liberia, ELWA	4760do	
2100	2200		Malaysia, RTM/Traxx FM	7295as	
2100	2200		New Zealand, Radio NZ International	17675pa	
2100	2200	DRM	New Zealand, Radio NZ International	15720pa	
2100	2200		Nigeria, Radio Nigeria/Kaduna	4770do	
2100	2200		Nigeria, Voice of Nigeria/Lagos	7255af	
2100	2200		North Korea, Voice of Korea	7560eu	13760eu
			15245eu		
2100	2200	vl	Papua New Guinea, Wantok R. Light	7325va	
2100	2200		South Africa, Channel Africa	3345af	
2100	2200	Sat/Sun	Spain, Radio Exterior Espana	9840eu	
2100	2200		Syria, Radio Damascus	9330eu	
2100	2200		UK, BBC World Service	3255af	3915as
			5875va	5905as	6005af
			6195as	7120af	15400af
2100	2200	DRM	UK, BBC World Service	5875eu	

2100	2200		Ukraine, R Ukraine International	7510eu	
2100	2200		USA, Armed Forces Radio Network	4319usb	
			5446usb	5765usb	6350usb
			10320usb	12133usb	13362usb
2100	2200		USA, Voice of America	6080af	7555as
			15580af		
2100	2200		USA, WBCQ Monticello ME	7415am	9330am
			15420am		
2100	2200		USA, WBOH Newport NC	5920am	
2100	2200		USA, WEWN Vandiver AL	17595af	
2100	2200		USA, WHRA Greenbush ME	11885va	
2100	2200		USA, WHRI Cypress Creek SC		11785am
			15665na		
2100	2200		USA, WINB Red Lion PA	13570am	
2100	2200		USA, WRMI Miami FL	9955am	
2100	2200		USA, WTJC Newport NC	9370na	
2100	2200		USA, WWCR Nashville TN	7465na	9980na
			12160na	13845na	
2100	2200	Sun	USA, WWRB Manchester TN	11920af	
2100	2200		USA, WWRB Manchester TN	9385va	12180va
2100	2200		USA, WYFR/Family Radio Worldwide	7430eu	3230af
			7430eu	11565eu	17845af
2100	2200		Zambia, CVC Intl/Christian Voice	4965af	
2115	2200		Egypt, Radio Cairo	11550eu	
2130	2157		Czech Rep, Radio Prague	9410af	11600na
2130	2200		Australia, ABC NT Katherine	5025do	
2130	2200		Australia, ABC NT Tennant Creek		4910do
2130	2200	mtwhfa	Canada, CBC NQ SW Service	9625na	
2130	2200		Guam, KSDA/ Adventist World Radio		11850as
2130	2200		Lithuania, Mighty KBC Radio	6055eu	
2130	2200		Netherlands, R Netherlands Worldwide	7420pa	
2130	2200		Sweden, Radio Sweden	6065va	7420pa

2200 UTC - 5PM EST / 4PM CST / 2PM PST

2200	2210		Syria, Radio Damascus	9330eu	
2200	2220		Japan, NHK World/Radio Japan		13640as
2200	2229		Lithuania, Mighty KBC Radio	6055eu	
2200	2230		India, All India Radio	9910pa	11620pa
			11715pa		
2200	2235		New Zealand, Radio NZ International	17675pa	
2200	2235	DRM	New Zealand, Radio NZ International	15720pa	
2200	2245		Egypt, Radio Cairo	11550eu	
2200	2245		USA, WYFR/Family Radio Worldwide	15770af	
2200	2255		Turkey, Voice of Turkey	6195va	
2200	2256		Romania, R Romania International	7185eu	
			9675eu	9790na	
2200	2257		China, China Radio International	7175eu	
2200	2300		Anguilla, Worldwide Univ Network	6090am	
2200	2300		Australia, ABC NT Alice Springs	2310do	
			4835do		
2200	2300		Australia, ABC NT Katherine	5025do	
2200	2300		Australia, ABC NT Tennant Creek	4910do	
2200	2300		Australia, Radio Australia	11840va	12010va
			13630pa	15230va	15240pa
			17785pa		15515as
2200	2300	smtwhf	Canada, CBC NQ SW Service	9625na	
2200	2300		Canada, CFVP Calgary AB	6030na	
2200	2300		Canada, CKZN St John's NF	6160na	
2200	2300		Canada, CKZU Vancouver BC		6160na
2200	2300		China, China Radio International	9590as	
2200	2300		Costa Rica, Worldwide Univ Network	13750va	
2200	2300		Equatorial Guinea, Radio Africa	15190af	
2200	2300		Guyana, Voice of Guyana	3291do	
2200	2300	vl	Liberia, ELWA	4760do	
2200	2300		Malaysia, RTM/Traxx FM	7295as	
2200	2300		Nigeria, Radio Nigeria/Kaduna	4770do	
2200	2300		Nigeria, Voice of Nigeria/Lagos	7255af	
2200	2300	vl	Papua New Guinea, Wantok R. Light	7325va	
2200	2300		Taiwan, R Taiwan International	9355eu	
2200	2300		UK, BBC World Service	5905as	5975as
			6005af	6195as	9740as
			15400af		12095af
2200	2300		USA, Armed Forces Radio Network	4319usb	
			5446usb	5765usb	6350usb
			10320usb	12133usb	13362usb
2200	2300		USA, Voice of America	5895va	5915va
			7120va	7460as	7555va
			11725va	15185va	9415va
2200	2300		USA, WBCQ Monticello ME	7415am	9330am
2200	2300		USA, WBOH Newport NC	5920am	
2200	2300		USA, WEWN Vandiver AL	15665af	
2200	2300		USA, WHRA Greenbush ME	11885va	
2200	2300		USA, WHRI Cypress Creek SC		7385na
			9615na	11785am	
2200	2300		USA, WINB Red Lion PA	9265am	
2200	2300		USA, WRMI Miami FL	9955am	

2200	2300	USA, WTJC Newport NC	9370na	
2200	2300	USA, WWCR Nashville TN	5070na	7465na
		9980na	13845na	
2200	2300	USA, WWRB Manchester TN	5050na	6890va
		9385va	12180va	
2200	2300	USA, WYFR/Family Radio Worldwide	5950na	
		11740na	15440na	
2200	2300	Zambia, CVC Intl/Christian Voice	4965af	
2230	2257	Czech Rep, Radio Prague	7345na	9415na
2230	2300	Guam, KSDA/ Adventist World Radio	15320as	
2230	2300	Sweden, Radio Sweden	9800na	
2230	2300	USA, Voice of America	9570va	11705va
		15145va		
2236	2300	New Zealand, Radio NZ International	15720pa	
2236	2300	New Zealand, Radio NZ International	17675pa	
2245	2300	India, All India Radio	9705eu	9950as
		11620as	11645as	13605as

2300 UTC - 6PM EST / 5PM CST / 3PM PST

2300	0000	Anguilla, Worldwide Univ Network	6090am	
2300	0000	Australia, ABC NT Alice Springs	2310do	
		4835do		
2300	0000	Australia, ABC NT Katherine	5025do	
2300	0000	Australia, ABC NT Tennant Creek	4910do	
2300	0000	Australia, Radio Australia	9660as	11840va
		12010pa	12080pa	13690pa
		15240pa	15560va	17785pa
2300	0000	Bulgaria, Radio Bulgaria	9700na	11700na
2300	0000	Canada, CBC NQ SW Service	9625na	
2300	0000	Canada, CFVP Calgary AB	6030na	
2300	0000	Canada, CKZN St John's NF	6160na	
2300	0000	Canada, CKZU Vancouver BC	6160na	
2300	0000	China, China Radio International	5915as	
		5990am	6145na	7180as
		11690as	11970ca	
2300	0000	China, China Radio International	9800ca	
2300	0000	Costa Rica, Worldwide Univ Network	13750va	
2300	0000	Cuba, Radio Havana Cuba	9505am	9550am
2300	0000	Egypt, Radio Cairo	9280na	
2300	0000	Guyana, Voice of Guyana	3291do	
2300	0000	India, All India Radio	9950as	11645as
		13605as		
2300	0000	Malaysia, RTM/Traxx FM	7295as	
2300	0000	New Zealand, Radio NZ International	15720pa	
2300	0000	New Zealand, Radio NZ International	17675pa	
2300	0000	Papua New Guinea, Wantok R. Light	7325va	
2300	0000	UK, BBC World Service	3915as	5965as
		6195as	9740as	9885as
		12010as		
2300	0000	USA, Armed Forces Radio Network	4319usb	
		5446usb	5765usb	6350usb
		10320usb	12133usb	13362usb
2300	0000	USA, Voice of America	5895va	5915va
		7120as	7555as	9415va
		11725va	13755va	15145va
		15185va		
2300	0000	USA, WBCQ Monticello ME	7415am	9330am
2300	0000	USA, WBOH Newport NC	5920am	
2300	0000	USA, WEWN Vandiver AL	15665af	
2300	0000	USA, WHRA Greenbush ME	5850eu	
2300	0000	USA, WHRI Cypress Creek SC	7315na	
		9615na	11785am	
2300	0000	USA, WHRI Cypress Creek SC	11785na	
2300	0000	USA, WHRI Cypress Creek SC	7315am	
2300	0000	USA, WRMI Miami FL	9955am	
2300	0000	USA, WTJC Newport NC	9370na	
2300	0000	USA, WWCR Nashville TN	5070na	7465na
		9980na	13845na	
2300	0000	USA, WWRB Manchester TN	5050na	6890va
		9385va	12180va	
2300	0000	USA, WYFR/Family Radio Worldwide	5950na	
		15255sa	15440sa	17750sa
2300	0000	Zambia, CVC Intl/Christian Voice	4965af	
2300	2305	Liberia, ELWA	4760do	
2300	2315	Nigeria, Radio Nigeria/Kaduna	4770do	
2300	2327	Vatican City, Vatican Radio	9600va	12035va
2300	2330	Australia, Radio Australia	15240pa	
2300	2345	USA, WYFR/Family Radio Worldwide	11740na	
2305	0000	Canada, R Canada International	6100na	
2305	0000	Greece, Voice of Greece	7475eu	9420eu
2315	2330	Croatia, Croatian Radio	9925na	
2330	0000	Australia, Radio Australia	15415as	17750va
2330	0000	Lithuania, Radio Vilnius	9875na	
2330	0000	UK, BBC World Service	9580as	
2330	0000	USA, Voice of America	7350va	9570va
		13755va	15145va	15340va
2330	2358	Vietnam, Voice of Vietnam	9840as	12020as

MT ENGLISH LANGUAGE SHORTWAVE STATION RESOURCE GUIDE

Albania, Radio Tirana	http://rtsh.sil.at/
Angola, Radio Nacional de Angola	www.rna.ao/
Anguilla, Worldwide Univ Network	www.worldwideuniversitynetwork.com/
Argentina, RAE	www.radionacional.gov.ar/rae/rae.asp
Australia, ABC NT Alice Springs	www.abc.net.au/radio/
Australia, ABC NT Katherine	www.abc.net.au/radio/
Australia, ABC NT Tennant Creek	www.abc.net.au/radio/
Australia, CVC International	www.christianvision.com/
Australia, HCJB Global	www.hcjb.org/
Australia, Radio Australia	www.abc.net.au/ra/
Austria, AWR Europe	www.awr2.org/
Austria, Radio Austria Intl	http://oe1.orf.at/service/international
Bahrain, Radio Bahrain	www.radiobahrain.net/
Bangladesh, Bangla Betar	www.betar.org.bd/
Belarus, Radio	www.radiobelarus.tvr.by/eng/
Bhutan, BBS	www.bbs.com.bt/
Bulgaria, Radio	www.bnr.bg/
Canada, CBC NQ SW Service	www.cbc.ca/north/
Canada, Radio Canada Intl	www.rcinet.ca/
China, China Radio Intl	www.cri.cn/
Costa Rica, Worldwide Univ Network	www.worldwideuniversitynetwork.com/
Croatia, Croatian Radio	www.hrt.hr/
Cuba, Radio Havana	www.radiohc.cu/
Czech Rep, Radio Prague	www.radio.cz/en/
Finland, Overcomer Ministries	www.overcomerministries.org
France, Radio France Intl	http://rfienglish.com
Germany, AWR Europe	www.awr2.org/
Germany, CVC Intl/Voice Africa	www.christianvision.com/
Germany, Deutsche Welle	www.dw-world.de/
Germany, Overcomer Ministries	www.overcomerministry.org/
Germany, Pan American BC	www.radiopan.com/
Germany, The Overcomer Ministries	www.overcomerministry.org/
Germany, TWR Europe	www.twr.org/
Greece, Voice of Greece	www.voiceofgreece.gr/
Guam, AWR/KSDA	www.awr2.org/
Guam, TWR/KTWR	www.twr.org/
Guyana, Voice of	http://voiceofguyana.com/
India, All India Radio	www.allindiaradio.org/
Indonesia, Voice of Indonesia	www.vri-online.com/
Iran, Voice of the Islamic Rep of Iran	www2.irib.ir/worldservice/
Italy, IRRS	www.nexus.org
Japan, NHK World/Radio Japan	www.nhk.or.jp/english/
Jordan, Radio	www.rtv.jo/rj/index.php
Latvia, Radio SWH	www.radioswh.lv/index.php
Liberia, ELWA	www.elwaministries.org/
Liberia, Star Radio	www.radioswh.lv/index.php
Libya, Voice of Africa	www.ljbc.net/home.php
Lithuania, Radio Vilnius	www.lrt.lt/
Malaysia, RTM/Traxx FM	www.traxxfm.net/index.htm
Malaysia, RTM/Voice of Malaysia	http://202.190.233.9/vom/utama.htm
Monaco, TWR Europe	www.twr.org/
Nepal, Radio Nepal	www.radionepal.org/
Netherlands, Radio Netherlands	www.radioneetherlands.nl/
New Zealand, Radio NZ Intl	www.rnz.com
Nigeria, Radio, Natl Svc/Abuja	http://radionigeriaonline.com
Nigeria, Radio/Kaduna	http://radionigeriaonline.com
Nigeria, Voice of/ Ext. Svc Lagos	www.voiceofnigeria.org
Oman, Radio Oman	www.oman-tv.gov.om
Pakistan, Radio	www.radio.gov.pk
Papua New Guinea, NBC	www.nbc.com.pg/
Papua New Guinea, Wantok R. Light	http://wantokr.radio.net/
Philippines, Radio Pilipinas	www.radiopilipinas.com/
Poland, Polish Radio	www.polskieradio.pl/zagranica/gb/
Romania, Radio Romania Intl	www.rrr.ro/
Russia, Voice of Russia	www.vor.ru/world.html
Saudi Arabia, BSKSA	www.saudiradio.net/
Slovakia, Radio Slovakia Int	www.rsi.sk
Solomon Islands, SIBC	www.sibsonline.com.sb/
South Africa, AWR Africa	www.awr2.org/
South Africa, Channel Africa	www.channelafrica.org
South Africa, Trans World Radio	www.twr.org/
South Korea, KBS World Radio	http://rki.kbs.co.kr/english/
Spain, Radio Exterior Espana	www.ree.mne.es/
Sri Lanka, SLBC	www.slbc.lk
Swaziland, Trans World Radio	www.twr.org/
Sweden, Radio	www.sr.se/rs/english/
Syria, Radio Damascus	www.rtv.gov.sy/
Taiwan, Radio Taiwan Intl	http://english.rti.org.tw/
Thailand, Radio	www.hsk9.com/
Turkey, Voice of	www.trt.net.tr
UK, BBC World Service	www.bbc.co.uk/worldservice/
UK, Bible Voice BC	www.biblevoice.org/
UK, FEBA	www.feba.org.uk
UK, Sudan Radio Service	www.sudanradio.org/
Ukraine, Radio Ukraine Intl	www.nrcu.gov.ua/
USA, American Forces Radio	http://myafn.dodmedia.osd.mil/
USA, KNLS Anchor Point AK	www.knls.org/
USA, KTBN Salt Lake City UT	www.tbn.org/
USA, KWHR Naalehu HI	www.whr.org/
USA, Voice of America	www.voanews.com/
USA, WBCQ Monticello ME	www.wbcq.com/
USA, WBOH Newport NC	www.fbnradio.com/
USA, WEWN Vandiver AL	www.ewtn.com
USA, WHRA Greenbush ME	www.whr.org/
USA, WHRI Cypress Creek SC	www.whr.org/
USA, WINB Red Lion PA	www.winb.com/
USA, WRMI Miami FL	www.wrmi.net/
USA, WTJC Newport NC	www.fbnradio.com/
USA, WWCR Nashville TN	www.wwcr.com
USA, WWRB Manchester TN	www.wwrb.org/
USA, WYFR/Family Radio Worldwide	www.worldwide.familyradio.org
Uzbekistan, CVC International	www.christianvision.com/
Vatican City, Vatican Radio	www.vaticanradio.org/
Vietnam, Voice of Vietnam	www.vov.org.vn
Yemen, Rep of Yemen Radio	www.yemenradio.net
Zambia, CVC Intl/Christian Voice	www.christianvision.com/



Crisis Monitoring

We have had several natural disasters in recent months and the most common question I get in email and on the radio news-groups is, "Where can I hear what is going on?"

During the recent hurricanes that affected the Gulf Coast, we conducted extended monitoring of various military/government frequencies to get a feel for the communications that might be heard and that were associated with the emergency.

Since Automatic Link Establishment (ALE) is the primary vehicle that the federal and military agencies use to hook up their stations for communications, we loaded up Charles Brain's PC-ALE program and let it scan a variety of federal radio nets. Here is our exclusive list of various federal services monitored here in Brasstown, NC. (All frequencies are kilohertz and the mode was ALE/USB)

BRASSTOWN LOGGINGS: EMERGENCY RESPONSE

3349.0 DoD Tri Service MARS HF ALE Network:- KBPNNN WKCNNN WWLNNN
 4490.0 SHARES SCN Ch 3:- AAT3BF KNY58 USDAEOC2 ZLSNNN
 4757.0 National Public Health Radio Network:- KEY798
 4765.0 DoD Tri Service MARS HF ALE Network:- 2PBAFA OARNNN WKCNNN WWLNNN
 4780.0 National Guard:- FC6 FC8FEM FR5FEM INDOPS R22977 TX6
 5015.0 US Army Corps of Engineers (USACE) Ch 2:- G334 LRD1 WUK
 5135.0 US Secure:- FC8 FR5FEM MA1NC NA1SH SEMOHQ SEMO03
 5140.0 US Secure:- 0401MT FC6 FC8
 5158.0 DoD Tri Service MARS HF ALE Network:- 2BBAFA AAN3DCA AAR3DS AAT3BF EDXNNN KBPNNN OARNNN WKCNNN WWLNNN ZLSNNN
 5211.0 INDOPS
 5378.0 FEMA National Radio System (FNARS):- FC4FEM FC8FEM FR5FEM
 5402.0 FEMA National Radio System (FNARS):- FC8FEM FR5FEM
 5711.0 SHARES SCN Channel 4:- AAT3BF KBPNNN KEY798 KTQ313 NNN0KEF ZLSNNN
 5778.5 National Guard:- A10
 5817.0 National Guard STARC Nationwide Net:- NRK RLD VAB
 5820.0 National Public Health Radio Network:- KGD825
 5821.0 FEMA National Radio System (FNARS):- FC8FEM FR5FEM
 5847.0 National Guard STARC Nationwide Net:- NRK
 5961.0 FEMA National Radio System (FNARS):- FR5FEM
 6020.0 US Army Corps of Engineers (USACE) Ch 6:- G323
 6049.0 FEMA National Radio System (FNARS):- FR5FEM
 6106.0 FEMA National Radio System (FNARS):- FR5FEM
 6151.0 FEMA National Radio System (FNARS):- FR5FEM
 6766.0 National Guard STARC Nationwide Net:- ADW OFF
 6785.0 US Army Corps of Engineers (USACE) Ch 7:- FCJ G323 LGV LRD1 UV5
 6800.0 SHARES SCN BBS Ch 9:- KTQ313
 6806.0 USAF CAP ALE:- 0004WICAP 0011ARCAP 0011OKCAP 0048FLCAP 054NHQCAP 100SWRCAP 101NCRCAP 101SWRCAP 0355OKCAP 0902ALCAP 2204LACAP RIC AVS
 6809.0 FEMA National Radio System (FNARS):- FC6 FC8FEM FR5FEM TX6 VA3FEM
 7348.0 FEMA National Radio System (FNARS):- FC8FEM FR3 FR4FEM FR5FEM VA3FEM
 7428.0 FEMA National Radio System (FNARS) - 441FEMAUX FC6FEM FR5FEM
 7480.0 FEMA National Radio System (FNARS):- 0401MT FC6 TX6
 7642.0 DoD Tri Service MARS HF ALE Network:- 2PBAFA EBCNNN KBPNNN OARNNN WKCNNN ZLSNNN
 8012.0 USAF CAP ALE:- 004WICAP 0011ARCAP 0011OKCAP 0048FLCAP 054NHQCAP 100SWRCAP 0902ALCAP 2204LACAP AVS RIC

8023.0 National Public Health Radio Network:- 119CDCS05
 8037.0 National Guard STARC Nationwide Net:- NRK VAB
 8047.0 National Guard STARC Nationwide Net:- HQ703N L060AN NRK R23922 T040NN T3Z238 VAB
 8050.0 FEMA National Radio System (FNARS):- FC8FEM FR5FEM
 8093.0 National Guard STARC Nationwide Net:- T3Z238
 8622.0 National Guard STARC Nationwide Net:- BB2
 9025.0 USAF HF-GCS Scope Command ALE HF Network:- ADW CRO DMLS HAW JNR MCC NW1 NW2 OFF PLA
 9106.0 SHARES SCN Channel 5:- 2PBAFA 9999OKCAP AAT3BF BF741 KGD825 NNN0OAR
 9122.5 US Army Corps of Engineers (USACE) Ch 8:- G323
 9143.5 National Guard STARC Nationwide Net:- NGTROOPCMD NRK RLD VAB, AQC MUZIXV
 9224.0 DoD Tri Service MARS HF ALE Network:- 2PBAFA EBCNNN WKCNNN
 9414.5 National Public Health Radio Network:- 119CDCS05 KGD825
 9462.0 FEMA National Radio System (FNARS) - 441FEMAUX FC1 FC1FMA FC6 FC8FEM FR5 MA1 R11FMA VA3FEM
 10194.0 FEMA National Radio System (FNARS):- 473FEMAUX FC1 FC1FMA FC6 FC8 FC8FEM FR5FEM MA1 R11FMA VT1
 10202.0 National Public Health Radio Network - 119CDCS05 (Arkansas) FC6 FC8FEM KGS825
 10588.0 FEMA National Radio System (FNARS):- 441FEMAUX FC8FEM FR5FEM
 10816.5 National Guard STARC Nationwide Net:- A040LN HQ703N M010AN M040SN M070ON N040CN R010IN T060XN
 11108.0 FEMA National Radio System (FNARS):- FC8FEM
 11217.0 SHARES SCN Channel 6 - AAT3BF BF741
 11226.0 USAF HF-GCS Scope Command ALE HF Network:- AED ADW, AQC D4QCDM
 11485.0 National Public Health Radio Network:- CRB T9ACBP
 11801.0 FEMA National Radio System (FNARS) - FR5FEM
 12087.0 National Guard STARC Nationwide Net:- HQ703N I100DN M010AN M080TN N040CN R24610 R27069 T1Z147 W100AN
 12216.0 FEMA National Radio System (FNARS):- FC1 FC6 FC8FEM FR3FEM FR5FEM VT1
 13242.0 DISA NIPR:- DL0005DAT ICZNPR MCCNPR OFFNPR
 13446.0 FEMA National Radio System (FNARS):- FC6 FC8FEM
 13473.5 DoD Tri Service MARS HF ALE Network:- 6NEAFA
 13568.0 National Guard STARC Nationwide Net:- A040LN T060XN
 13935.0 FEMA National Radio System (FNARS):- FC6
 14360.0 DISA NIPR:- MCCNPR
 14776.0 FEMA National Radio System (FNARS):- FC8FEM
 15094.0 SHARES SCN Ch 7:- 043NCS PR013 USARC5 YXPNNN
 15708.0 FEMA National Radio System (FNARS):- FC8FEM
 16338.5 National Guard STARC Nationwide Net:- HQ703N I100DN
 17485.5 National Guard STARC Nationwide Net:- HQ703N I100DN
 17519.0 FEMA National Radio System (FNARS):- FR5FEM
 19969.0 FEMA National Radio System (FNARS):- FC6 FC8

ALE ADDRESS DECODES

2PBAFA	AF MARS Arlington, VA
0004WICAP	AF CAP Wisconsin Wing Communications Officer
6NEAFA	AF MARS Unknown location
0011ARCAP	AF CAP Arkansas Wing Officer
0011OKCAP	AF CAP Oklahoma Wing Officer
043NCS	National Communications System Unknown location
0048FLCAP	AF CAP Florida Wing Officer
054NHQCAP	AF CAP Unknown location
100SWRCAP	AF CAP Southwest Region Unit
101NCRCAP	AF CAP North Central Region Unit
101SWRCAP	AF CAP Southwest Region Unit
119CDCS05	NPHRN Arkansas
0355OKCAP	AF CAP Oklahoma unit

0401MT	Secure Net Station	R010IN	National Guard Cranston, RI
441FEMAUX	FEMA Auxilliary Station Voice call: WGY 9441	R22977	National Guard UH-60A helicopter (78-22977)
473FEMAUX	FEMA Auxilliary Station Voice call: WGY 9473	R23922	National Guard UH-60A helicopter (83-23922)
0902ALCAP	AF CAP Alabama unit	R24610	National Guard UH-60A helicopter (87-24610)
2204LACAP	AF CAP Louisiana unit	R27069	National Guard UH-60A helicopter
9999OKCAP	AF CAP Oklahoma unit	R11FMA	FEMA Region 1 Emergency Unit Rhode Island
A10	US Army unknown location	RIC	AF CAP Region 2 MER/CAP National Technology Center
A040LN	National Guard Montgomery, AL		Richmond, VA
AAN3DCA	Army MARS Unknown location	RLD	National Guard Richland, VA
AAR3DS	Army MARS Haymarket, VA	SEMO03	New York Emergency Management - Region 3 Glen Falls, NY
AAT3BF	Army MARS Newark, DE		
ADW	AF Scope Command Andrews AFB, MD	SEMOHQ	New York Emergency Management - Headquarters Albany, NY
AED	AF Scope Command		
AVS	AF CAP National Headquarters Special Use Tactical Callsign/ALE Address (Avenging Spirit)	T1Z147	National Guard 1-147 AVN Madison, WI
	Army unknown location	T32238	National Guard 2-238 AVN Shelbyville, IN
BB2	Director of Military Support Washington, DC	T9ACBP	BICE Piper PA-42-720R Jacksonville AMB, FL (N9279A)
BF741	CBP AMOC Regional Communications Node Caribbean	T040NN	National Guard Nashville, TN
CRB		T060XN	National Guard Camp Mabry (Austin), TX
		TX6	Texas Emergency Management EOC Austin, TX
CRO	AF Scope Command Croughton AB, UK	USARC5	American Red Cross unknown location
DL0005DAT	AF E-3 AWACS Tinker AFB, OK	USDAEOC2	US Department of Agriculture Alternate EOC Riverdale, MD
DMLS	DoD Unknown agency/location		
EBCNNN	Navy/MC MARS West Virginia	UV5	Army Corps of Engineers unknown unit
EDXNNN	Navy/MC MARS Virginia	VA3FEM	Virginia Emergency Management EOC Richmond, VA
FC1	FEMA Region 1 Office Maynard, MA	VAB	National Guard Virginia Beach, VA
FC1FMA	FEMA Region 1 Emergency Unit Maynard, MA	VT1	Vermont Emergency Management EOC
FC4FEM	FEMA Region 4 Communications Manager Thomasville, GA	W100AN	National Guard Tacoma, WA
		WKCNNN	Navy/MC MARS Illinois
FC6	FEMA Region 6 Office Denton, TX	WUK	Army Corps of Engineers unknown unit
FC6FEM	FEMA Region 6 Communications Manager Denton, TX	WWLNNN	Navy/MC MARS Louisiana
FC8	FEMA Region 8 Office Denver, CO	YXPNNN	Navy/MC MARS Washington
FC8FEM	FEMA Region 8 Communications Manager Denver, CO	ZLSNNN	Navy/MC MARS Yorktown, VA
FCJ	Army Corps of Engineers unknown unit		
FR3	FEMA Region 3		
FR3FEM	FEMA Region 3		
FR4FEM	FEMA Region 4		
FR5	FEMA Region 5		
FR5FEM	FEMA Region 5		
G323	Army Corps of Engineers unknown unit		
G334	Army Corps of Engineers unknown unit		
HAW	AF Scope Command Ascension Island		
HQ703N	National Guard Readiness Center Arlington, VA		
I100DN	National Guard Boise, ID		
ICZNPR	Non-secure Internet Protocol Router Net NAS Sigonella (Sicily), Italy		
INDOPS	National Guard Operations Indianapolis, IN		
JNR	AF Scope Command Salinas, Puerto Rico		
KBPNNN	Navy/MC MARS Indiana		
KEY798	Environmental Protection Agency Panama City, FL		
KGD825	Environmental Protection Agency Boston, MA		
KG5825	US Government unknown agency/location		
KNY58	National Communications System - NTCN-HF Gadsden, AL		
KTQ313	Environmental Protection Agency Montgomery, AL		
L060AN	National Guard Jackson Barracks, New Orleans, LA		
LGV	Coast Guard Vessel USCGC Legare (WMEC-912)		
LRD1	Army Corps of Engineers Great Lakes and Ohio River Division Cincinnati, OH		
M010AN	National Guard Milford, MA		
M040SN	National Guard Jackson, MS		
M070ON	National Guard Jefferson City, MO		
M080TN	National Guard Helena, MT		
MA1NC	New Hampshire Office of Emergency Management Manchester, NH		
MCC	AF Scope Command McClellan, CA (West Coast)		
MCCNPR	Non-secure Internet Protocol Router Net McClellan, CA (West Coast)		
N040CN	National Guard Raleigh, NC		
NA1SH	New Hampshire Office of Emergency Management Nashua, NH		
NGTROOPCMD	National Guard Columbus, OH		
NNN0KEF	Navy/MC MARS Bristol, VA		
NNN0OAR	Navy/MC MARS Machesny Park, IL		
NRK	National Guard Svc/B Btry 1st Bn 111th FA/HHB 1st Bn 111th FA Norfolk, VA		
NW1	DoD Nightwatch 1 NAOE E-4B aircraft		
NW2	DoD Nightwatch 2 NAOE E-4B aircraft		
OARNNN	Navy/MC MARS Machesny Park, IL		
OFF	AF Scope Command Offutt AFB, NE		
OFFNPR	Non-secure Internet Protocol Router Net Offutt AFB, NE		
PLA	AF Scope Command Lajes Field, Azores		
PR013	US Government unknown agency/location		

COTHEN

In addition to the pre/post emergency frequencies listed above, if a massive search and rescue (SAR) situation exists, I recommend monitoring the US Customs Service COTHEN (Customs Over The Horizon Enforcement Network). Since customs is now part of the Department of Homeland Security, you will find quite a bit of the Coast Guard SAR units active on this far flung network.

Here is what we monitored during our disaster monitoring project.

FREQUENCIES:

5732.0 7527.0 8912.0 10242.0 11494.0 13907.0 15867.0 18594.0 20890.0 23214.0 25350.0 kHz (Mode ALE/USB)

ALE ADDRESS DECODES:

500 501 701 716 720 790 Coast Guard HC-130H
54P VE5 Unknown units
A10 A40 A47 A97 Customs UH-60A helicopters
C06 Army Corps of Engineers Rapid Response Vehicle #6
CDRPRI CONUS HF (South) Remote Cedar Rapids, IA
CNT ICE Regional Communications Node Central Central US
CRB CBP AMOC Regional Communications Node Caribbean
D02 D03 D31 D45 D48 D70 Customs detector aircraft
EST CBP AMOC Regional Communications Node Eastern US
F33 F40 F41 Coast Guard HU-25 aircraft
HSD USCGC Drummond (WPB-1323)
I43 I86 I94 I97 Customs Cessna interceptor aircraft
J01 J03 J04 J09 J10 J12 J14 J15 J19 J23 J29 J31 J33 J38 Coast Guard HH-60J helicopters
K15 K57 Customs Kilo units
LGV USCGC Legare (WMEC-912)
LNT Coast Guard CAMSLANT Chesapeake, VA
N01 N03 Coast Guard HC-114A aircraft
OKDPRI CONUS HF Remote Oklahoma (Tentative)
OPB OPBAT Services Center Nassau, Bahamas
PAC Coast Guard CAMSPAC Point Reyes, CA
PR1PRI PR1SEC Puerto Rico HF Omni Directional Remote Punta Salinas, PR
T16 T42 T47 T72 Customs tracker aircraft
TSC Technical Service Center Orlando, FL
UCG Coast Guard CAMSPAC Point Reyes, CA
V12 Customs victor units

You can get additional information on the decodes above on my Blog websites at

<http://mt-milcom.blogspot.com/> and <http://monitor-post.blogspot.com/>

That does it for this month. Until next time, 73 and good hunting.

Listening in to the Political Conventions

As you read this column in the November issue of *Monitoring Times*, we should finally be wrapping up the 2008 political season and deciding who will be the next president of the United States. It's been a long road to this point and the penultimate events prior to the general election were the major political conventions in Denver and St. Paul.

In past years, political conventions were always large media events, but the primary federal involvement was the Secret Service protection of the candidates and incumbent office holders. But recent history has seen increased federal agency involvement in political campaigns and media events. Both of the political conventions were designated as "National Security Special Events," which calls for federal agencies to be the primary group responsible for coordinating overall public safety and security operations.

Many people were surprised at the size of the federal agency response to these events and wondered out loud if this wasn't going overboard. Planning for events like these, the axiom is usually "Hope for the best, but plan for the worst," and it looked like they were planning for the worst imaginable. Remember that the agencies supervising these events have access to information and intelligence sources that the general public does not and they plan events like this to cover any possibility, however far fetched it may seem.

Although the Secret Service was the primary federal agency responsible for both of the major political conventions, many other federal and military agencies were part of the operations in both Denver and Minneapolis / St. Paul. Other agencies seen in operation included the ATF, FBI, US Postal Inspectors and various agencies

under the Department of Homeland Security, such as the US Coast Guard, US Customs & Border Protection (CBP), FEMA and the Federal Protective Service.

The military also supported operations at the conventions, both on the ground and in the air. National Guard units on the ground were positioned to support security perimeters around both convention sites. There were also C-26 observation aircraft from the National Guard flying over the convention cities providing real-time video feeds from whatever locations they were tasked to operate over. And the USAF & NORAD, along with the Customs and Border Patrol Air Marine Division (AMD) operated various forms of surveillance of the airspace around the convention sites, and directed Combat Air Patrol flights to intercept wayward aircraft.

In both cities, Joint Operations Centers were established that allowed all of these different agencies to operate with each other as seamlessly as possible. Operations information, intelligence and real-time video feeds were shared between the various agencies in the JOC, and there appeared to be some communications interconnections between all of the different agencies at this command center.

As would be expected, events like the two political conventions provided an overwhelming amount of communications to try and monitor. In both of the convention cities, local area and state police agencies provided hundreds of personnel for public safety and security support. The news media of all sorts in both locations offered an incredible number of radio and wireless microphone channels to try and find. And, of course, there were the federal and military frequencies.

❖ General Observations

Some observations from both conventions:

It appears that many of the UHF federal channels were being used by FEMA and subsidiary groups, such as Disaster Medical Assistance Teams (DMAT), Urban Search & Rescue (USAR) and possibly others. There were HAZMAT and medical teams using these channels, as well as personnel setting up networking and communications systems. The Minnesota National Guard units were also operating in the federal UHF band, observing protests and assisting in general security. Also, a number of federal UHF channels had traffic that was never identified as to who was using them.

Although the CBP Air Marine Division was reported to be supporting both conventions, we did not seem to hear them on the air in St. Paul. And the US Coast Guard was very active on the St. Paul Riverfront with their Marine Safety and Security Teams, but had only a couple of brief fly-bys of some HH-65 Dolphin helicopters. The USCG was busy on some of the new 138-150 MHz band channels that we published back in the May 2008 *Fed Files*.

With the Secret Service being the lead federal law-enforcement agency at these events, all of the known VHF channels for the USSS were very active. Protective details for Obama (code name RENEGADE) and McCain (code name PHOENIX) operated on the standard Secret Service channels. Some activity was heard on the White House Communications Agency (WHCA) SIERRA channel early on in St. Paul, but once President Bush cancelled his plans to attend the RNC in person, the activity disappeared.

Two frequencies closely associated with the Secret Service Executive Protection Details were heard active at both conventions. 167.0125 MHz and 167.0375 MHz are two new Secret Service channels that came into wide use when the radio systems at the White House in Washington DC were upgraded to digital. While neither the President nor Vice President attended the conventions, both channels were busy. What these channels are called and what they were used for by the Secret Service at the conventions remains a mystery.

❖ Frequencies Logged

On the frequencies listed below, I have included any supplemental information that



was available, such as units heard, and if the frequency was used in analog or digital mode, and any CTCSS or P25 NAC information recorded.

C = Analog with CTCSS tone
N = P25 NAC code.
P25 = P25 digital mode

Denver – Democrat National Convention

In addition to the conventional frequencies below, there was a great deal of convention related activity on the FPS managed UHF trunked system, sometimes referred to as the “Front Range Federal Radio System.” Information on that system can be found here: www.radioreference.com/apps/db/?sid=2990

126.2000	AM	DAGGER 1 and DAGGER 3, National Guard C-26 aerial surveillance
139.0250		
148.1500		
149.0250	P25	Encrypted
150.3750	P25	Encrypted
162.2875	P25	Encrypted
162.6125		
162.9750	N653	JHAT (Joint Hazard Assessment Team) Units
163.1000	N724	
163.7000	N169	
163.8875	N167	FBI, reported as a repeater output
164.4000	N001	USSS PAPA
164.5500	N167	JOC Common Event Operations channel?
164.6500	N001	USSS TANGO
164.8874	N001	USSS OSCAR
165.2125	N001	USSS MIKE
165.2375	C100.0	DHS Customs & Border Protection
165.3750	N001	USSS CHARLIE
165.7875	N001	USSS BAKER
166.4375		
166.4500	N724	
166.4625		DHS Common
166.4750		
166.5875		
167.0125	N001	USSS
167.0375	N001	USSS
167.1625		
167.2625	N653	Linked with 171.4375 MHz
167.3375		
167.4625	N167	FBI
167.4875	N167	FBI, reported as input to 163.8875 MHz
167.5125	N167	FBI
167.5375	N293	Also heard in analog mode
167.6250	P25	
168.7250		
167.7875	N167	FBI
168.3500	N724	
168.7250	C123.0	
168.9125	N167	FBI
170.1000	P25	
170.1750	C151.4	
170.6625	N653	Referred to as Channel 3
170.6750	N875	
170.7500	N293	US Marshals Service
171.3625		
171.3875	P25	Unknown agency GOLF units
171.4375	N653	Federal Interoperability repeater used by JHAT Units
171.6875	N293	Unknown agency leaving town in a convoy
171.8000	N724	
171.9875	P25	
172.1875	N653	
172.2250		
172.9000	N001	TSA – Primary
173.1500		
173.5250	N724	
173.6250	NB3E	Unusual P25 NAC value on this one, unknown agency
173.8750		
271.0000	AM	NORAD BIGFOOT with CBP OMAHA air assets

350.0250	AM	OMAHA units with HAMMER
386.3250	N293	Nat'l Guard Repeater Ch 15 - Input
388.0250		BLACK units
388.3250		CADDY SHACK. GREENTeam and DECON units
392.5500	C156.7	
396.3250	N293	Nat'l Guard Repeater Ch 15 - Output
398.0250		WHITE and BLACK units
398.3250		
399.9250		FOOTBALL units at Invesco Field (ISR Channel 13)
407.4750	P25	Encrypted
407.7250	P25	Encrypted
407.7750	P25	Encrypted
407.8750		Analog
408.5000		
408.7250	P25	Encrypted
408.9250		Units at Pepsi Center, “Switch to channel 4”
409.0000	P25	
409.1250	P25	Encrypted
409.3750	C167.9	
409.5250	N293	Convention delegate bus motorcades
409.7375		Analog repeater
410.1625	P25	
410.5625	P25	Encrypted
410.6250	P25	
412.8250		Possible use by US Information Agency TV crew
413.3875		Analog
413.9250	C127.3	
414.7750		Possible use by US Information Agency TV crew
415.5000		
415.5500		
415.9000		Possibly parking coordination at Invesco Fields
415.9750	P25 & Analog	
416.1250	P25	
416.7750	P25	Encrypted
417.7750	P25	Clear and encrypted, identified as CONTROL
418.2750		Possible use by the US Information Agency TV crew
418.3500		Both P25 and analog used at Invesco Field
418.4000	P25	COWBOY and SHAMROCK units
418.5000		
418.5250		Analog, “LEE, from ADVANCE”
419.6750	P25	Clear and encrypted

St. Paul – Republican National Convention

126.2000	AM	National Guard C-26 aircraft MERLIN & DAGGER with DAGGER CONTROL providing video downlink
138.4250	N263	Possibly USAF Security Police on scene
138.9875	P25	
139.9750	P25	USCG NET 101
143.4750	C100.0	USCG Auxiliary with drills on the river
148.5000	P25	
148.5750	CSQ	MN National Guard “WILD” units
150.3000	N293	USCG NET 107 ATHENS and RED 2
150.7250	N293	USCG NET 105 ATHENS and ROMEO
162.1250	P25	USCG NET 109
162.6125	CSQ	“Switch back to channel 1...”
162.6375	P25	
162.7625	N167	FBI
163.2000	N136	US Marshals Service
163.8500	P25E	
164.3375	C167.9	
164.4000	N001	USSS PAPA (May be Minneapolis/St. Paul Field Office)
164.5500	N293	JOC Common Event Frequency?
164.6500	N001	USSS TANGO
164.8875	N001	USSS OSCAR
165.2125	N001	USSS MIKE
165.2375	C100.0	DHS CBP NET 1
165.3750	N001	USSS CHARLIE
165.7875	N001	USSS BAKER
165.9250		
166.4625	P-25	DHS Common
166.5125	P25	WHCA SIERRA
166.5875	C100.0	DHS Customs
167.0125	N001	USSS
167.0375	N001	USSS, mention of HUNTSMAN
167.2125	N167	FBI

167.2375	N167	FBI, may be linked with 171.6875
167.2625	N167	FBI
167.4375	N167	FBI, may be linked with 173.9375
167.5125	N167	FBI
167.5375	P25	
167.6375	N167	FBI
167.7625	N167	FBI
167.7875		
168.8625	P25	Input to 164.5500
169.1750		
169.4125	N167	
169.4500	C100.0	DHS CBP NET 2
170.6250	N653	
170.7375		
171.6125		Possible Federal Interoperability repeater
170.6250	N263	SKYWALKER, VIPER units
171.6125	N653	Possible Federal Interoperability repeater
171.6875	N167	May be linked with 167.2375
173.8125	N167	FBI, identified as “HRT”/ “TSR”
173.9375	N167	May be linked with 167.4375
406.1125	N653	FEMA & DMAT related, HAZMAT tents
406.2625		
407.0000	N201	DHS Federal Protective Service
407.7250	N482	Encrypted, USPS Postal Inspectors
407.7625	N293	ECHO 4 and WHISKEY units, talk of IP addresses and antennas
408.3375	N293	Encrypted, probable FEMA use
408.4250		Weak analog
409.0000	N293	SECURITY, DMAT teams at Saint Paul PD
409.1375		
409.3375	CSQ	input to 418.3375 repeater
409.5250	N293	FEMA operations
409.7375		
410.6625	P25	Encrypted
412.8375	C118.8	Possible use by USIA TV crew
413.2250	CSQ	MN National Guard FOXTROT & PAPA units
413.2750		
413.3000	CSQ	MN National Guard units
413.3125		
413.3375	N293	FEMA operations
414.6250		
414.7500	P25	USPS Postal Inspectors
414.9875	N293	“CP” FEMA operations
416.0000	N201	Input to 407.0000 repeater, Federal Protective Service
416.7250	N482	Input to 407.7250 repeater, USPS Inspectors
417.3375	N293	Input to 408.3375 repeater, FEMA
418.3375	CSQ	Analog repeater, sounded like military EOD teams
418.5250	C71.7	Parking coordination, unknown agency

Special thanks go to all those who helped search and scan the political convention airwaves and wished to remain anonymous. The next big monitoring event that will finally wrap up the whole election cycle will be the Presidential Inauguration in Washington, DC. I'll bring you as much of that event as I can in an upcoming *Fed Files* column. See you then!

Longwave Resources

✓ **Sounds of Longwave** CD or Audio Cassette (please specify) featuring WWVB, Omega, Whistlers, Beacons, European Broadcasters, and more! **\$13.95** postpaid

✓ **The BeaconFinder** A 65-page guide listing Frequency, ID and Location for hundreds of LF beacons and utility stations. Covers 0-530 kHz. **\$13.95** postpaid

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TRACONs: Overview and N California

A TRACON (Terminal Radar Approach Control) is just one part of the Air Traffic Control (ATC) system. But you, as an aircraft listener, can better enjoy what you hear when you understand how TRACONs fit into the scheme of things.

TRACONs exist in most metro areas where there are one or more large airports. Most are located on airport property but some are stand-alone facilities.

The primary responsibility of a TRACON is to control air traffic in the area around busy, large airports, but not within the airport control area itself. There are about 200 TRACONs in the U.S. when military ones are included, but to be more precise, the Air Force uses the term RAPCON (Radar Approach Control); the Navy uses RATCF (Radar Air Traffic Control Facility); and the Army uses ARAC (Army Radar Approach Control).

For a list of U.S. TRACONs, see: www.faa.gov/about/office_org/headquarters_offices/ato/tracon/. Let's take a closer look.

❖ Flight Sequence

Airliners, cargo carriers, and other aircraft that fly by Instrument Flight Rules (IFR) are in contact with Air Traffic Controllers from when they begin to taxi at their departing airport until they finish taxiing at their destination airport.

A typical progression would be Clearance Delivery (before taxiing starts), Ground Control (taxiing phase), Tower (clearance for takeoff and takeoff), and then to Departure Control (the first contact with the TRACON facility).

TRACONs safely transition flights from an airport area up to where the Air Route Traffic Control Center (ARTCC) controllers take over with the "enroute" phase of the flight at much higher altitudes. While in contact with Departure Control, the plane will pass through the airspace sectors of one or more TRACON controllers before being handed off to an ARTCC controller.

At cruise altitude, the plane will be handed off many times from one controller to another (from one radar controlled sector to another). During cross-country flights, this includes from ARTCC to ARTCC with the controllers making this rather seamless. For an ARTCC map, see <http://freqofnature.net:8080/faq/index.php>

When nearing the destination airport area, the ARTCC controller will start the plane on its descent and will hand it off to Approach Control at the TRACON for the airport.

As the plane continues its descent and nears the airport, the Approach Controller will hand

the plane off to the Tower or to other Approach Controllers who eventually hand it off to the Tower.

The same controller, on the same frequency, will identify as "Departure" or "Approach" — depending on the flight of a given plane.

The Tower Controller will communicate with the plane during landing and after touchdown and then hand it off to Ground Control for taxiing.

Go to www.airnav.com/airports/ and pick a large airport and you will see the frequencies from Clearance Delivery through Departure Control listed.

Also, the radio call for a TRACON is usually "Approach" preceded by its name, such as "Reno Approach," "Seattle Approach," etc. The radio call for an ARTCC is "Center" preceded by its name such as "Oakland Center," "Salt Lake Center," etc.

❖ Read Back

At each step of the way, as an aircraft progresses on its flight, it is given the next controller's frequency by the current controller.

The exception is that the Departure Control frequency is given during the Clearance Delivery phase, and the Tower, shortly after the aircraft lifts off, will say "contact Departure" but with no mention of the frequency.

Other than this exception, the pilot will "read back" the frequency just given to him/her. Even if you, as a listener, are too distant from the ground station to hear it, you will hear the frequency read back from the pilot for much greater distances and know where to listen next.

❖ TRACON Airspace

The lateral area of a TRACON airspace is often defined by a radius of sorts of 30 to 50 nautical miles around a primary airport. The TRACON area can include a number of airports, some towered and some non-towered. Among the non-towered airports are both public and private airports. It is therefore possible for some flights to originate and terminate all within a given TRACON's airspace. In this case, there are no handoffs to the ARTCC. If a flight is by Visual Flight Rules (VFR), there will be no ATC contact and no handoffs unless such planes request radar "flight following."

TRACON airspace, like ARTCC airspace, is broken up into sectors, each with its own radar controller who maintains voice contact with the IFR planes in his or her sector. The

sectors are usually irregularly shaped chunks of three-dimensional airspace that all fit together. The shapes are designed to best accommodate the air traffic flow for a given area.

TRACON airspace ceilings, the upper altitude before the ARTCC controller takes over, can vary from TRACON to TRACON. There are some from surface to 10,000 feet MSL (Mean Sea Level), to 12,000 feet MSL, but some go much higher, like FL230.

Note that an altitude such as "Flight Level Two Three Zero," as it is spoken, is an indicated altitude of 23,000 feet based on a standard altimeter setting of 29.92 which is used above 18,000 feet MSL for all "Flight Levels." See the August 2005 issue of *MT: Altitudes, Altimeters, Settings and More*, for additional details on altitude.

❖ Combined Sectors

Some TRACONs close at night, while others that operate 24/7 may combine sectors during periods of low air traffic. This may cause some confusing listening. If you listen to a single sector frequency and are able to hear the ground side, you will always hear the aircraft in that sector talking with the controller. If at other times, you hear the controller but only some of the planes, it is likely that two or more sectors have been combined and one controller is controlling multiple sectors.

When the controller keys to transmit, he/she brings up more than one frequency. The planes will still be on the proper frequency for the sector they are in, but what this means is that you must monitor all the frequencies of the combined sectors in order to hear all the aircraft a particular controller is communicating with at that time.

You might hear a controller say "Change to my frequency 125.4," or something similar, when sectors are combined. When the pilot changes frequencies, he will end up talking to the same controller.

TRACON sector graphics are hard to come by on the Internet. Seeing how sectors fit together helps to make sense of combined sectors, handoffs, and traffic flow. Personal sleuthing as you listen, and sharing info via on-line aircraft scanner forums, is your best shot.

❖ VHF / UHF

Frequencies in the UHF 225-380 MHz range are for military/government use, but you will hear controllers on UHF talking to airliners.

The thing is, VHF ATC frequencies most often have UHF pairs, and when the controller keys up to communicate with an airliner on VHF, that same transmission also goes out on UHF – where there are no airliners. Conversely, when the controller talks to military aircraft on UHF, it will be heard on VHF – where there may or may not be other military aircraft.

❖ Consolidated TRACONS

More recently in the history of Air Traffic Control, some major metro area TRACONS have combined into single facilities and, as a result, control much larger areas with the goals of improved efficiency and capacity. Eight areas have done this: Atlanta, Chicago, Dallas-Fort Worth, Denver, New York, Northern California, Potomac (Baltimore-Washington-Virginia), and Southern California.

SOCAL TRACON (SCT), the busiest in the world, was formerly Los Angeles, Burbank, Ontario, Coast (Orange County), and San Diego TRACONS. SCT is located at Miramar Marine Corps Air Station (MCAS).

One concern about consolidated TRACONS is that a major equipment failure can cause an ATC outage of far greater proportion than a failure of one of the former regional TRACONS.

❖ Northern California TRACON (NCT)

NCT, commissioned in 2002, is a consolidation of Bay, Sacramento, Stockton, and Monterey TRACONS, plus some Oakland Center airspace. The NCT facility is located at the eastern edge of the old Mather AFB, now Mather Airport (MHR), about 12 miles east of Sacramento.

For a great “zoomable” NCT satellite photo, go to <http://maps.live.com/> and enter “11375 Douglas Road 95655” (no quotes) and then click on “Aerial” and zoom in on the round area. Click and drag to re-center. Click on “Bird’s eye” after fairly close and centered. The six antenna towers are at the upper-right of the facility, one of which is pictured in this article.

From NASA Ames Research Center, current NCT Airspace includes: “An area of 17,156 square nautical miles; 9,051 square nautical miles is FL230 and below; 8,105 square nautical miles is FL190 and below; Seven ASR terminal primary radar systems; Three ARSR back-up enroute radar systems”



This is one of six communications towers at NCT. The center pole is probably for lightning protection. The antennas may be something on the order of: www.wade-antenna.com/TACO/FAAApproved.pdf



A side note: ASR is Airport Surveillance Radar. It is shorter range and usually with 4.8 second 360 degree sweeps of the antenna and radar scope. ARSR is Air-Route Surveillance Radar. It is long range and usually with 12 second sweeps. See the February 2008 issue of *MT: Radar, ADS-B, and the Future*, for more details on Radar. Also consider *MT Anthology* CDs for other interesting and informative articles: www.grove-ent.com/mtantindividual.html

NCT airspace is irregularly-shaped and has a ceiling of FL230 in the northerly part and FL190 in the southerly part. Oakland Center airspace begins directly above of NCT airspace.

Within NCT airspace, there are eighteen towered airports / air bases and numerous public and private non-towered airports.

THE EIGHTEEN TOWERED AIRPORTS / AIR BASES in NCT AIRSPACE
Beale Air Force Base (BAB)
Castle Airport (MER)
Hayward Executive Airport (HWD)
Livermore Municipal Airport (LVK)
Modesto City-County Airport (MOD)
Moffett Federal Airfield (NUQ)
Monterey Peninsula Airport (MRY)
Oakland International (OAK)
Palo Alto Airport (PAO)
Reid-Hillview Airport (RHV)
Sacramento Executive Airport (SAC)
Sacramento International (SMF)
Sacramento Mather Airport (MHR)
Salinas Municipal Airport (SNS)
San Carlos Airport (SQL)
San Francisco International (SFO)
San Jose International Airport (SJC)
Stockton Metropolitan Airport (SCK)

❖ Finding Frequencies

For airport frequencies, go to www.airnav.com/airports/ and enter the three-letter airport code. Using Sacramento International Airport (SMF) as an example www.airnav.com/airport/KSMF scroll to “Airport Communications.” There you will see 125.25(S-SW) 125.4(N-E) 127.4(E-SE) 134.8(W-N) under NORCAL Approach and Departure with each representing a frequency for a given sector – depending on the approach or departure direction of travel. These represent just a few of NCT’s many frequencies and sectors.

If you are interested in the published UHF frequencies for the above sectors, scroll down to IAPs - Instrument Approach Procedures. Click on any of the blue download links at the right. For this example, it yields those in the follow-

ing insert, as well as Tower, Ground Control, Clearance Delivery, and ATIS.

NORCAL APP CON			
(W-N) 134.8	270.25	(NE) 125.4	259.1
(S-SW) 125.25	257.9	(E-SE) 127.4	317.5

❖ Travis RAPCON

Tucked up against the northwest side of the NCT area and west of Sacramento, is Travis RAPCON. From a Travis document at www.darrylramm.com/WordPress/wp-content/uploads/2007/11/afd-070807-047.pdf that includes graphics and photos - “The airspace serviced by Travis Approach Control is used by military aircraft operating in this area, along with IFR and numerous VFR aircraft out of Buchanan Field (Concord), Napa County, Nut Tree, Yolo and four other local airports. This all leads to the increased potential for midair collisions in the Travis Air Force Base area.

“Travis AFB’s mission is to provide airlift support and refueling capabilities worldwide. However, there are frequent training flights in the local area by C-5s, KC-10s, E-6s, and C-17s. In addition to these locally based aircraft, transiting aircraft like the C-130, KC-135 and T-38 fly approaches at Travis from a variety of directions, airspeeds and from altitudes ranging from 1800 to 10000 MSL. Commercial ‘heavy’ airframes, including the Boeing 747 and 757, routinely fly into and out of Travis AFB.”

Travis RAPCON handles 250,000 operations annually and is an important part of Northern California aircraft listening. Handoffs between Travis RAPCON and NCT or Oakland Center are common. Travis RAPCON frequencies are 119.9 / 322.325, 126.6 / 291.0, and 128.4 / 294.7 MHz.

❖ APCH/DEP via an ARTCC

When an airport is located outside of a TRACON area, some of the services normally provided by a TRACON, or even by an airport itself, may be handled by the ARTCC for that area. This example www.airnav.com/airport/TVL states: APCH/DEP SERVICE PROVIDED BY OAKLAND ARTCC ON FREQ 127.95 (SQUAW VALLEY RCAG) AND FREQ 316.1 (SACRAMENTO RCAG). CLNC DEL PROVIDED BY OAKLAND ARTCC ON FREQ 134.3 (SOUTH LAKE TAHOE RCAG).

An RCAG is a Remote Communications Air-to-Ground site. Since controllers cannot be located physically in all the areas where communications are needed, remote and unmanned receivers and transmitters are used. These are connected to an ATC facility many miles away where the controllers are. To see Oakland Center (ZOA) RCAG locations and frequencies, go to <http://freqofnature.net:8080/faa/aff.php> and use the down-arrow, then select ZOA.

❖ In Closing

NCT has many frequencies and sectors. Sorting them out can be a challenging pursuit for the hobby listener along with all the other aircraft frequencies in this part of California. Have fun, take good notes. See you next time.

Howard Mortimer, WB2ZWI

The longwave world suffered a sad loss on August 4th 2008, with the passing of Howard "Mort" Mortimer, WB2ZWI of Syracuse, NY. Mort battled a number of illnesses in recent years, and most recently had been a patient at St. Camillus Health and Rehabilitation Center near Syracuse. He was 83.

Mort was the very first contributor to *Below 500 kHz* when I assumed the editorship in 1991. That spring, when I was writing a trial column for *MT*, I was in urgent need of listener logs. I'd been away from the hobby for a few years, so I didn't have any recent logs of my own. I asked Mort for a sampling from his logbook, and he gladly obliged.

Mort and I went on to form a close friendship, meeting regularly at hamfests around Western and Central NY. I even made a trip to his home station in 1997 which was the subject of an *MT* column describing his 1-watt Lowfer experimental station "ZWI" that operated on 178.6 kHz.

Mort could always be spotted at hamfests by his trademark straw hat, and the hand-made sign he wore on his back labeled with his Lowfer beacon's frequency and call sign. He was always eager to talk to newcomers about longwave radio and explain the mystique of the basement band to anyone who would listen. I know that many people tuned into the band for the first time based on his enthusiasm.

In the late 1990s I had the pleasure of attending some receiving DXpeditions to the Adirondacks with Mort and a group of Central NY listeners. These trips with will always hold special memories for me. Mort is survived by his wife An-nice, and his children Daniel, Jennifer, Susan, and Philip, as well as many siblings, grandchildren, and nieces and nephews. Our thoughts are with his family at this time of loss.



Howard "Mort" Mortimer, WB2ZWI explaining the operation of his 1-watt experimental beacon station. The station had been heard as far away as Minnesota. (File photo by Kevin Carey)

❖ Mailbag

Jim Cassilly, K3FLA, wrote with a question regarding longwave broadcast stations. He writes: "I have been reading your column and am greatly surprised that there are music and news broadcasting stations in the 150+ kHz area of the spectrum! Could you explain what these broadcasts are for? Who are their listeners? Are there inexpensive radios for these stations in and around these countries?"

Great questions, Jim. These stations are similar to the AM broadcasters we are familiar with in North America, with local and regional programming the norm. The propagation of longwave allows these stations to cover a very wide geographic area (often several countries) even during the daylight. Longwave has always more popular in European countries than it is in the U.S., and yes, receivers for hearing the band are plentiful in Europe, including in automobiles. The longwave broadcast band runs from 150 to 280 kHz.

LF broadcasters can sometimes be heard in North America when a path of darkness exists between both continents. On the Eastern coast of the U.S. this means listening for them at 1:30a.m. or later, and conditions seem to favor the winter months (lower static). Don't expect "armchair copy" on these signals, but with a good antenna you can often make out the songs and voice being broadcast. For a handy list of who's active on the band, you may want to visit: www.geocities.com/SunsetStrip/Underground/8585/longwave.html.

❖ News from ARRL

The August 29th edition of the *ARRL Letter* carried the following news on 500 kHz operation... "ARRL Applies for Expansion of 500-kHz Experimental License: On August 22, the ARRL applied to the FCC for expansion of the 500-kHz experimental license WD2XSH. If approved, this application will raise the total number of stations from 20 to 40. This will provide greater geographic coverage, including Alaska and Hawaii, and will provide more opportunities for ground-wave testing. Also included are requests for an expanded frequency band (495-510 kHz) and portable operation within 50 km. The current four modulation modes (CW, PSK-31, FSK-31, and MSK-31) are included. -Fritz Raab, W1FR."

❖ Reader Loggings

The loggings for this month are courtesy of Richard Palmer (AZ) who uses an Icom R75

receiver, Timewave DSP599zx Noise Reduction Filter, and a Homebrew active whip mounted 13-feet high. Thanks for your logs, Richard. Reader loggings are always welcome at *Below 500 kHz*. To submit loggings, visit the column's home page at www.monitoringtimes.com/html/below_500_khz.html, where you can download our free Loggings Template.

TABLE 1. SELECTED LF LOGGINGS

FRQ	ID	ST/PR/ITU	CITY
214	CHX	MEX	Choir
214	XA	JPN	Oshima
219	GAV	AK	Gustavus
222	CUW	MEX	Chihuahua
233	ALJ	AK	Johnstone Point
238	KT	NZL	Kaitaia
248	ZZP	BC	Sandspit
260	NF	NFK	Norfolk Island
270	FA	SMO	Faleolo
270	SRL	MEX	Santa Rosalia
280	IPA	PAQ	Easter Island
283	RT	AUI	Rurutu
283	DUT	AK	Dutch Harbor
285	MH	TUA	Manihi Atoll
296	LGD	OR	La Grande
302	XY	YT	Whitehorse
307	NA	FJI	Nausori
316	MAJ	MHL	Majuro
332	POA	HI	Pahoa
333	AA	TUA	Anaa
339	FN	TUA	Fangatau
341	ELF	AK	Cold Bay
347	TB	AUI	Tubuai
349	TP	TUA	Takapoto
352	RG	CKS	Rarotonga
353	LLD	HI	Lanai
353	NH	MAR	Nuku Hiva
358	OA	TUA	Rangiroa
368	GYM	MEX	Guaymas
370	AO	TUA	Hao Atoll
371	YK	WA	Yakima
372	AV	AUI	Raivavae
372	RU	OCE	Raiatea
375	GUA	GTM	Guatemala City
376	NP	TUA	Napuka
378	MO	OCE	Moorea
382	GRN	MEX	Guerrero Negro
385	TKL	GTM	Tikal/Flores
387	SPP	SAP	San Andres Is.
390	HBT	AK	Sand Point
391	DDP	PR	San Juan
394	RWO	AK	Kodiak
400	ENS	MEX	Ensenada
415	CBC	CYM	Cayman Brac
415	IEE	PO	Platform Irene
526	ZLS	BAH	Stella Maris

* For a complete list of ITU country codes, see www.wordiq.com/definition/ITU_letter_codes

Pirate DX Season Returns

With the return of fall and then winter propagation conditions on the shortwave bands, we are back to prime conditions for DXing pirate radio stations. Summer static levels are now considerably diminished. Longer darkness paths improve reception of even low power pirates over greater distances. As a result, your odds of hearing pirate broadcasts are now much better than they were a couple of months ago.

One of the best periods of the entire year for hearing pirate stations is the four day USA holiday weekend of Thanksgiving at the end of November on the 28th through the 30th. October 13 was the date for celebration of Canadian Thanksgiving, so the weekend of October 10-13 also produced improved odds of pirate broadcast reception last month. For these reasons, the autumn season of the year is always one of the best times during the year to DX for shortwave pirates in North America.

❖ Chinese Pirate!

During the 2008 Olympics, Reporters Without Borders actually operated a pirate/ clandestine station from a transmitter in Beijing. No *MT* readers logged this one, but it was an astonishing first in pirate radio. The station claimed to broadcast in three languages with an ID of Radio Without Borders. You can hear the English program from this station at www.rsf-persan.org/chine/ANG.mp3 Programs in French and Mandarin were also allegedly broadcast.

The format of the Chinese FM pirate was against human rights violations and internet censorship within China. The station claimed to operate in Beijing on 104.4 MHz FM. They said that this was the first FM pirate to operate within China since 1949. Harry Helms notes that the UK *Times Online* reporters did print a logging of the station in their newspaper. With credit to that newspaper via Harry Helms, here is the first logging ever of a Chinese FM pirate station in Beijing:

"Paris-based Reporters Without Borders began broadcasting on local FM radio to several districts of Beijing at 8.08 a.m local time (0000 GMT), denouncing China's grip on media and expression. The broadcast, in both English and Mandarin Chinese, while often indistinct, lasted for 20 minutes."

❖ Brooklyn Pirate Fined

According to *Radio Ink* magazine via Harry Helms, the FCC has fined Jean Idalbert \$10,000

for allegedly operating an FM pirate on 90.9 MHz from Brooklyn, NY. The FCC says that they previously sent Idalbert a notice of apparent liability, to which he did not respond. So, in August, the FCC levied the fine.

❖ WBCQ Covers Pirates

No sooner did the September *Monitoring Times* cover WBCQ than suddenly your editor appeared twice in two days on the station during August with a discussion of pirate radio and the very weak Ohio economy. One show aired on Radio Jamba International, while the other show was on Radio New York International, both relayed via the 50 kW WBCQ signal on 7415 kHz.

❖ Chavez Shuts Down "Pirates"

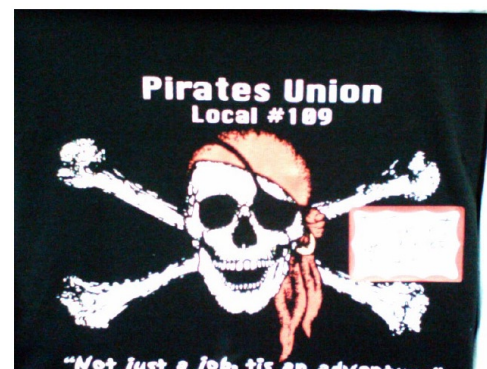
According to both *El Universo* in Venezuela and the *La Prensa* news wire in Havana, the Venezuelan government shut down the Rumbera Network on 101.5 MHz and Llanera on 91.3 MHz in August. The Venezuelan government and the Cuban news service claimed that politics had nothing to do with the action by the Venezuelan military to shut the stations down. Instead, they claimed that the stations had not followed proper procedures for getting a normal Venezuelan broadcasting license. Both stations operated in Guárico state.

Other organizations such as the Committee to Protect Journalists charged that many other stations lack official licenses in Venezuela, but nevertheless operate without government interference. The broadcasting scene in Venezuela obviously will deserve future scrutiny.

❖ What We Are Hearing

Monitoring Times readers heard eighteen different pirate radio stations this month. You can hear them, too, if you use some simple techniques. Pirate radio stations never use regularly announced schedules, but shortwave pirate broadcasting increases noticeably on weekends and major holidays. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but more than 95% of all North American shortwave pirate broadcasts are heard on 6925 kHz, plus or minus 30 or 40 kHz.

Kracker Radio International- His rock music and comedy make good use of spare time while he runs for Vice President of the USA on the Commander Bunny for President ticket.



(krackerradio@pmlol.com)

MAC Radio- Paul Starr's oldies rock pirate still uses various odd frequencies such as 3275, 6850, 6925 and 6950 kHz. (macshortwave@yahoo.com)

Maple Leaf Radio- Several Dxers report receipt of their attractive QSL that we printed last month. (radio.mapleleaf@gmail.com)

Northwoods Radio- "Broadcasting from the Great Lakes," their rock music is distinctive because of their loon call interval signal. (northwoodsradio@yahoo.com)

Radio Appalachia- From Moundsville, WV, the home of the WV State Pen, their fiddle music claims to be the "Voice of the Ohio Valley." (None)

Radio Jamba International- Rock music and comedy dominates their format. (Belfast)

RPR, Real Pirate Radio- This station has been broadcasting primarily rock music shows, but they did once air a numbers station parody. (None, report via FRN)

Sycko Radio- Their rock music and novelty music and comedy format has been on the air once again. (syckoradio@yahoo.com)

The Crystal Ship- Despite obviously false reports about their demise, the "Voice of the Blue States Republic" is still on variable frequencies such as 5385 and 6700 kHz with classic rock music and left wing political commentary. (Belfast and tcshortwave@yahoo.com)

The Wave- Rock oldies and novelty music normally dominates their shows. (Belfast)

Undercover Radio- Dr. Benway's adventures and rock music are still on the pirate bands, often from an announced mobile transmitter. (Merlin and undercoverradio@gmail.com)

Voice of Barack Obama Radio- What apparently was their first broadcast featured little more than this political identification. (None)

WBNY- Commander Bunny of the Rodent Revolution and his campaign for President of the United States with Kracker for VP was a steady fixture on the pirate bands prior to the USA election. (Belfast and rodentrevolutionhq@yahoo.com)

WFUQ- This one features comedy and obscene identification slogans. (None known)

Wind Up Radio- Little is known about this new one that apparently features "mellow music." (None known)

Wolverine Radio- Like many pirates, they produce rock music and comedy programming. Their interval signal is a rock riff. (None announced)

WMPR- "Micro Power Radio's" dance party techno rock programming is easy to spot. (None; has verified only at the Kulpville Winter SWL Festival)

WNKR- This Europirate rock music pirate has been receiving North American pirate relays lately. (None known for USA relay)

Continued on page 71

Back to The Mode

Okay, like most hams, I have tried to keep my frown upside down when thinking about the current HF band conditions and the long, slow (very very *very* slow) start of the solar cycle upswing. There is no truth to the rumor that I sit on my roof at high noon waving magic talismans, burning incense, and shouting SUNSPOTS at the big yellow ball in the sky. (Not ONE of my neighbor's chickens has been sacrificed... honest!) But whenever HF hams gather these days, not nearly on the air as often as they would like, the general feeling is that the bands remain relatively dead.

Well, I can attest to the fact that the bands are very noisy, but if they are dead, it is because people aren't making the effort. Okay, so maybe the definition of DX has to be drawn in a few thousand miles, but there are still opportunities to talk to other hams if you give it a try.

Listening to all that band noise can be very disconcerting. But when all is said and done, I can think of one fairly reliable mode of HF communication that might just be the tool to break through the noise and get some good old fashioned rag chewing started. If you have followed this column for any length of time, you will not be surprised by this next statement: Have you considered giving CW a try?

Okay, enough with the groans already. One of the reasons CW remains a viable mode of emergency communication is that it works fairly well in marginal conditions. And believe me, the current solar conditions are about as marginal as you can get. Also if your rig has a nice tight CW filter in it, you will cut back so much of that band noise, you will think you're working FM. Well, not quite, but it sure will be more tolerable than trying to pull out a phone signal.

I make no apologies for being a dedicated CW freak. "The Mode" has stood me in good stead through this low spot in the sunspot cycle. If you are a "No Code" or "Low Code" ham, that doesn't mean you need to negate CW activity. Likewise, if you are an old timer who hasn't dusted off his or her key in a Cow's Age, now might be the time to get back into trim CW wise. Let's start with the "No Code" folks, and we'll build up to skills that anyone can use to bring their CW signals back on the bands.

❖ It Just Ain't All That Hard

Okay, so just how do you go about learning this Morse Code thing anyway? If you are willing to commit about 15 minutes per day for about a month (take a few minutes off your lunch

break), you can master the basics of CW and get started getting on the air. English consists of 26 letters and 10 numeric characters. Add to that the period (.), comma (,), Question mark (?) and Dash (/) and you have all you need to get along on the air. Yes, there are a few more punctuation characters and "pro-signs" to learn but, once you have the basics down, those will come easily.

Using one of the training tools we will talk about later in this article, commit yourself to learning ONE new character per day for the first three weeks of practice. After that, you should be confident enough to pick up two characters per day. Doing this, you will have the basic code information mastered in a month.

Now, here is an old trick from the Novice world. It seems that, when most folks use this method to get the old 5 word per minute (WPM) basic speed down, over this length of time, they sort of naturally crept up to between 7 and 10 WPM. So you will not only be learning the code, you will be building your speed as well.

Most folks want to start using their new-found skill to copy code off the air while they are learning. For this reason, you may want to master the characters in order of frequency of common use:

E T A O I N S R H L D C U M F P G W Y B V
K X J Q Z 1 2 3 4 5 6 7 8 9 . , ? /

❖ It's Okay to Be Bad

One of the behaviors that tend to block mastery of the code for a lot of folks, is the strong desire to capture every character with no skips or errors. That way lies madness, especially when you start out. And old rule of thumb for building code speed was to increase your training speed by 1/2 WPM once you were successfully copying 75%.

In the good old days when you sat for the code test, you were allowed a minute once the sending was done to fill in the gaps in your copy. Believe me, all the way up to my 20 WPM Extra exam, that minute saved my bacon! If, while you are copying code, you miss a character or two, just skip it! In the time you take to figure out what you missed you will be 3 or 4 more characters behind. Drive on! With practice, the number of missed characters will go down and you will soon be able to send "Solid Copy OM."

It's also okay to miss characters during a QSO. You are not a Secret Agent copying a message vital to national security. You are having a conversation with a kindred spirit. Feel free to ask for fills and repeats.

❖ Start Copying Off The Air... Now!

Even if you only have a couple of characters under your belt, tune down to the CW portions of the bands and start listening for the ones you know. It will be a while before you have enough letters going for you to make sense of what is being said, but you want to begin to get the feeling of what code sounds like, and, more importantly, the flow of a common QSO. You can even try to pick out the characters you know from people sending at speeds much higher than you can normally handle. This is one of the tools for building speed.

You can also begin to listen in to the regular CW practice sessions held by The American Radio Relay League (ARRL). They run both slow and fast sessions daily, as well as daily CW bulletins. The current Code Practice schedule can be found at www.arrl.org/w1law.html#w1lawsked

During the Slow Speed session, keep copying up until you are only missing about 50%. During the High Speed session, keep trying to copy down until you are achieving solid copy. Regardless of your skill level, take a shot at copying as much of the CW bulletin as you can. It is sent at 18 WPM, so don't be discouraged as you start out. It is all about practice. The more time you put in, the faster you will progress.

❖ Training Tools

Now, many folks get right with CW just using off the air monitoring. But beyond copying off the air, there are many tools out there to help you get your CW skills into shape.

One of my favorite CW training toys is the MFJ-413 Basic Code Tutor \$49.95 www.mfjenterprises.com/Product.php?productid=MFJ-413

I still carry mine in my day to day "Go Bag." I use it during breaks during the day to stay sharp. Measuring 2.25" x 3.75" x 1" and weighing less than 5.5 ounces, it is a nice investment for anyone wanting to learn CW.



If you are interested in PC-based learning tools, you will find dozens out on the Web. The name of one of my favorites says it all. "Just Learn Morse Code" www.justlearnmorse-code.com/ is a comprehensive CW training tool shared freely by its designer Sigurd Stenersen, LB3KB. Sig's program is not only great for learning code from scratch, it is ideal for rediscovering stale skills for folks who have let a little too much dust gather on their key.

If you want to use the tried and true method of copying by way of transcription (We have gone from LPs, to tapes, and now to CDs), the ARRL is currently closing out their "Your Introduction to Morse Code" (ARRL #8314 www.arrl.org). Consisting of two Audio CDs with nearly 2-1/2 hours of practice, the system teaches Morse code at the basic 5 words-per-minute. The closeout price for these CDs is \$9.95. A good bargain for folks who learn best by this method.

❖ To Farnsworth Or Not To Farnsworth, That Is The Question

Developed by Donald Farnsworth W6TTB as a way to build speed, the Farnsworth method is in common use today, including by the ARRL in its training sessions. How this method generally works is that you send the characters at a high speed (usually 18-20 WPM), but you space them out according to the skill level of the trainee. For example, beginner training might be done with 18 WPM characters sent with 5 WPM spacing between the characters. This method has a good record of helping folks build speed and skill, without hitting plateaus brought about by increasing speed the more traditional way. It is a proven technique and I would recommend using it.

❖ Get On The Air ASAP

Once you have mastered the characters mentioned above, put them to use on the air. During the time you are learning the full character set, you will have time to set your equipment up for CW operation. This will include finding a good hand key and figuring out how to plug it into your rig.

Why did I say hand key? Because, if you are like most folks, an electronic keyer really doesn't bring anything to the table until your speed exceeds about 10 WPM. If your dream is to master a "Bug" (semiautomatic key), keep it on the shelf until you are near 20 WPM; it is just too hard to get a Bug's springs to play nice at lower speeds. Oh sure, some folks do it, but you can hear most of them on the air sending string of dots when things get out of hand.

Don't be afraid to get on the air at low speed. A week doesn't go by that I don't have at least one or two QSOs well under 10 WPM. You will find that, once you actually put your signal out there, your learning will advance a great deal faster than if you just copy code.

November is traditionally a big month for CW contests. The speeds tend to be high, but you can have lots of fun trying to copy as much as you can. You can still throw in your call at a

speed that is comfortable to you. Most Ops will slow down to give you the time of day.

❖ Join The Cause

There are lots of folks out there ready willing and able to help you build your CW skills. CW ops are by far the most patient and cooperative folks on the bands. I have found this to be the case since I was first licensed in the '70s, and it still holds true today.

One group organized specifically around the love and practice of Morse code is F.I.S.T.S., The International Morse Preservation Society. They have many things to offer the dedicated CW op, but most useful to anyone getting started (or getting back to) CW is their "Code Buddy" program. Through this program you will be paired up with a ham in good communication distance from your QTH. You meet on the air for training and assistance at mutually agreeable times. You can find out all about F.I.S.T.S. and their Code Buddy program at their web site www.fists.org/.

❖ See You Soon

So, I am hoping that in a month or so, I will be hearing some new folks down here on

UNCLE SKIP'S CONTEST CALENDAR	
ARRL Sweepstakes Contest (CW)	Nov 1 2100 UTC - Nov 3 0300 UTC
NA Collegiate ARC Championship (CW)	Nov 1 2100 UTC - Nov 3 0300 UTC
Kentucky QSO Party	Nov 8 1400 UTC - Nov 9 0600 UTC
ARRL Sweepstakes Contest (SSB)	Nov 15 2100 UTC - Nov 17 0300 UTC
NA Collegiate ARC Championship (SSB)	Nov 15 2100 UTC - Nov 17 0300 UTC
Run for the Bacon QRP Contest	Nov 17 0200 UTC - 0400 UTC
CQ Worldwide DX Contest (CW)	Nov 29 0000 UTC - Nov 30 2400 UTC
ARRL EME Contest	Nov 22 0000 UTC - Nov 23 2359 UTC

the bottom end of 40 meters. Have fun getting your Code on!

Outer Limits continued from page 59

❖ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses:

PO Box 1, Belfast, NY 14711
PO Box 109, Blue Ridge Summit, PA 17214
PO Box 146, Stoneham, MA 02180
PO Box 293, Merlin, Ontario N0P 1W0.

PO Box 69, Elkhorn, NE 68022 is no longer a valid address.

Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence. The best bulletin for submitting pirate loggings is the e-mailed *Free Radio Weekly* newsletter, free to contributors via freeradioweekly@gmail.com. A few pirates will sometimes QSL reports left on the outstanding Free Radio Network web site, at www.frn.net. The *ACE*, a formerly widely read print bulletin, now has a good loggings section and a valuable archive of *Free Radio Weekly* issues at www.theaceonline.com/

❖ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or the e-mail address atop the column. We thank this month's valuable contributors: Guy Atkins, Payallup, WA; Kirk Baxter, North Canton, OH; Jerry Berg, Lexington, MA; Artie Bigley, Columbus, OH; Rich D'Angelo, Wyomissing, PA; Gregory L. Dome, Onalaska, TX; Bill Finn, Philadelphia, PA; Harold Frodge, Midland, MI; Captain Ganja, Belfast, NY; William T. Hassig, Mt. Prospect, IL; Harry Helms, Corpus Christi, TX; Ed Insinger, Summit, NJ; Kracker Radio, Belfast, NY; Ed Kusalik, Camrose, Alberta; Chris Lobdell, Tewksbury, MA; Greg Majewski, Oakdale, CT; Christopher Macaviti, Harrisburg, PA; A. J. Michaels, Blue Ridge Summit, PA; George Maroti, Mt. Kisco, NY; Don Moore, Davenport, IA; Adrian Peterson, Indianapolis, IN; John Poet, Belfast, NY; Lee Reynolds, Lempster, NH; Lee Silvi, Mentor, OH; Bob Wilkner, Pompano Beach, FL; John Wilkins, Wheat Ridge, CO; Joe Wood, Greenback, TN; and an anonymous contributor.

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Let's Talk About Antennas Part Three of Three

In this three-part series, the first two parts covered a definition of the term "antenna," why increasing antenna gain is only sometimes useful, the meaning of signal-to-noise ratio (S/N), the effect of received noise and of receiver noise on reception, antenna radiation patterns, and ways to reduce noise for improving weak-signal reception.

This month we finish the series by considering some effects on communication of both vertical and horizontal radiation patterns, and the effect of antenna height above earth on vertical-radiation patterns.

As mentioned in the other parts of this series, it is always good to keep in mind the reciprocity principle: characteristics of an antenna including gain and radiation patterns remain the same, whether the antenna is used for transmitting or for receiving.

❖ Utilizing Antenna Radiation Patterns

Last month we discussed the value of radiation-patterns for attenuating (nulls), or maximizing (lobes) an antenna's responding. Now let's consider how we can design and orient an antenna system to take advantage of some factors in the way that signals travel from transmitting antenna to receiving antenna (signal propagation).

At VHF and higher:

At VHF and higher frequencies we generally want our signals to leave the transmitting antenna at low-vertical angles (fig. 1B), and

thus travel relatively parallel to the earth, or at least not at high angles. Signals at low angles will propagate toward, and go somewhat beyond the horizon. Thus we typically want antennas with low-angle, vertical-radiation patterns for VHF and higher frequencies.

Of course, communications with aircraft, space craft, and satellites require higher vertical-angle patterns. Vertically-polarized antennas such as ground planes and discones are useful at these frequencies for their non-directional, low vertical-angle performance.

Higher-gain vertical antennas give a lower vertical-angle radiation pattern than do the lower-gain ones. Beam antennas offer both lower-angle radiation as well as increased gain.

For Shortwave:

For shortwave (the HF band) and even medium-wave signals, short-range, local communications are often supported by ground waves from antennas with low vertical-angle radiation (fig. 1A). Vertical antennas are best for this ground-wave work.

For another kind of close-in communication using horizontal antennas at these frequencies, see NVIS propagation later in this discussion.

For longer-range (DX) communication on these bands, low vertical-angle radiation is also desirable, but here the waves leave the antenna at a low angle, travel to the ionosphere, and refract there, and return to earth far from the transmitting antenna (fig. 1A). Sometimes there are several of these "skips"

or "hops," so that the signals reach far beyond the horizon, even completely around the world when conditions are right for it. Both vertical and horizontally-oriented antennas are useful here.

Lower Medium Frequencies and Below:

For the lower medium frequencies and the bands below that, communication is almost always by ground waves. Here, various vertical antenna designs with low vertical-angle radiation patterns are the antennas of choice for transmitting. Ferrite-core loop antennas, air-wound loops, active antennas, Beverage (wave), and even random-length wire antennas are common choices for reception at these frequencies.

❖ Effect of Height above Ground

Generally speaking, the higher an antenna is mounted, the better it performs. However, there may be certain heights at which an antenna will perform maximally or minimally. At VHF and higher frequencies, antennas are often several wavelengths above the earth.

Often a combination of direct and ground-reflected waves (fig. 1B) from the same transmitting antenna will arrive together at the receiving antenna and combine there to produce the received signal. Varying the antenna's height above ground will vary the distance travelled by the wave reflected up to the antenna from the ground. Varying this distance varies the phase of that wave when it arrives at the antenna.

When the phases of the direct and ground reflected waves are the same, the waves add together to give maximum reception. When the phases of the two waves are different, there is less output from the antenna. So, there are best heights and worst heights for the antenna in such situations. This is not generally a concern below the VHF band.

At HF or lower frequencies, the antennas of most radio hobbyists are mounted less than a wavelength above the earth's surface. When transmitting, some of the waves leaving the antenna will reach the ground and reflect upwards. And during reception, some of the waves reaching the antenna will have been first reflected from the ground before reaching the antenna.

Depending on the conductivity of the earth and the height of the antenna above the

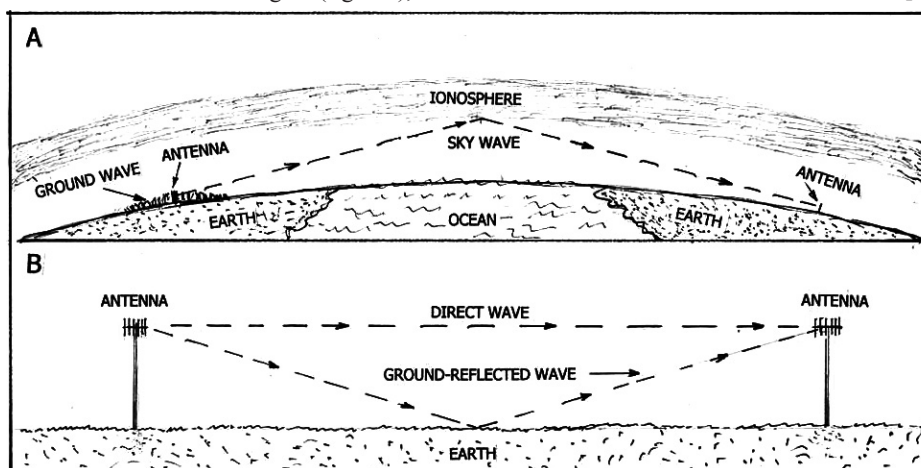


Fig. 1. HIGH-FREQUENCY ANTENNAS SHOWING GROUND WAVES, AND SKY WAVES (A), UHF ANTENNAS COMMUNICATING VIA A COMBINATION OF DIRECT WAVES, AND GROUND-REFLECTED WAVES (B).

This Month's Interesting Antenna-Related Web site:

A good discussion of antennas:
www.answers.com/radio%20antennas
Discussion of noise in radio:
[http://en.wikipedia.org/wiki/Noise_\(radio\)](http://en.wikipedia.org/wiki/Noise_(radio))

earth, these earth-reflected rays of the signal will interact with other rays of the signal. The result is a modified vertical-radiation pattern as compared to the shape that the pattern would have had if the antenna were suspended in outer space, for example.

On the HF band, horizontal antennas a quarter wavelength above earth produce a beam-antenna effect with the earth acting as a reflector. A majority of this antenna's radiation is thus directed upward. This is known as "near-vertical-incidence-radiation" or "NVIS." Here the radiation is relatively straight up to the ionosphere. This is reflected back to earth and scattered very broadly around the transmitting antenna. Thus, NVIS is useful for situations where signals from stations relatively close to one another are blocked by a mountain range or other obstacle between the stations.

If that same horizontal antenna were to be raised to a half wavelength above ground, then its radiation pattern will have predominately lower-angle radiation, and it will then be useful for long-distance sky-wave skip communication as described earlier.

The lower end of the popular Marconi quarter-wavelength vertical antenna must be

RADIO RIDDLES

Last Month:

I asked: "Since the unhappy man in last month's riddle performed so poorly as a conductor, perhaps his title should be changed from 'conductor' to something different. But what?"

Well, since very little current would flow through him, he could be called a "very high

value resistor," or a "leaky insulator." But let's be obstinate and call him a "low-mho conductor."

A what?! See this month's riddle below.

This Month:

In reference to the above paragraph, what is a "mho" anyhow? We'll have mho on this subject next month.

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much mho, in next month's issue of *Monitoring Times*. 'Til then, Peace, DX, and 73.

❖ And So:

We've now finished the three-part "Let's Talk About Antennas" series, but there's more to an antenna system than the antenna itself. In the near future we'll have columns on such things as antenna feed lines, antenna tuners, and even have a bit to say about the environment in which the antenna system is immersed.

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Restoring a 1957 Novice Transmitter

During all the years I've been writing a monthly restoration column, I've concentrated on receivers – mostly consumer-type broadcast sets. This began to change once I joined the *MT* staff. Responding to reader interests, I began to include more communication receivers and other communication-oriented gear among my restoration projects. But I've also touched on radio history from time to time, and it was in that spirit that I discussed 1920s self-excited ham transmitters last month.

Once I started thinking about transmitters, I remembered a cute little 1957-era rig that has been awaiting my attention for a couple of years. I've been wanting to get it on the air for some time so – what the heck – let's make it a restoration project! As always, your reader comments will be influential in determining whether this is a trend I should continue in the future.

❖ Ham Licensing in 1957

Now let's return to the year 1957 and let's say that you are a young person interested becoming a licensed radio amateur. Though your interest is high, both your Morse code proficiency and your technical expertise are limited. In an earlier era, you would be facing a 13-word-per-minute code requirement and a comprehensive examination in theory and regulations. So it's possible that you might lose interest, forget ham radio, and turn to some other avocation.

But some six years earlier, in an overhaul of the amateur radio licensing structure, a new entry-level license class was created. Called the Novice class, it was designed to help a newcomer with high interest and low expertise get on the

air more easily. Then operating and skills could be developed that would later qualify him/her to sit for a more advanced license. One could become a Novice by passing a 5-wpm code test and answering 20 fairly simple questions.

The license was good for one year and was non-renewable. But by then you were expected to be in a position to qualify for the much tougher General-Class test. (Since that time, FCC regulations governing the Amateur Radio Service have changed several times. Code proficiency is no longer required for any class of ham license and new Novice licenses are no longer being issued. However, current Novice license holders are now allowed to renew indefinitely.)

Novice operating privileges have also changed slightly over the years. But as a 1957 Novice, your transmitter would be restricted to 75 watts input power and would have to be crystal controlled (still the case today). You would be allowed to operate radiotelegraphy (c.w.) only, in specified windows of 80-, 40- and 15-meter bands. Voice operation was permitted in a specified window of the 2-meter band.

As a new Novice, you probably already have a receiver for listening in on amateur chatter and practicing code reception. Perhaps it was an inexpensive Hallicrafters set such as an S-38 or S-40. But now you are in the market for a transmitter.

Building a simple crystal-controlled c.w. transmitter covering the 80-, 40- and 15-meter bands would be a reasonable and inexpensive project – even for a relative beginner. But you want a rig that would continue to be useful even after you obtain the coveted General license. In addition to the three Novice bands, you'd like access to 20 meters. And you'd like to have the potential of operating voice (AM).

❖ The WRL Globe Scout 680

For a rig with those added features, a commercial unit begins to look like a good choice. Several manufacturers offer reasonably economical choices, but your eye is caught by an ad from World Radio Labs of Council Bluffs, Iowa. Long a supplier of amateur transmitting gear in all price ranges, WRL has just released the new Globe Scout 680.

Behind the attractive front panel is a bandswitching, crystal-controlled, AM and CW transmitter that runs 65 watts input on CW; 55 watts input on phone. Covered were all the ham bands of the time from 80 through 10 meters.

Of interest to those who entered the amateur radio ranks with a Technician Class license, the transmitter also covers 6 meters. Technicians had to pass a 5 wpm code test like Novices, but were given the same written exam administered to General Class applicants. They were issued a 5-year renewable license, but could operate only on 6 meters – where they had full amateur radio privileges with no special restrictions on operating mode or power.

As you study the specs still further, you find that in spite of its relatively modest price (\$9.95 kit; \$99.95 wired) this little rig has been thoughtfully designed to be as flexible as possible. The pi-network output circuit is switch-selectable to match either a 52-ohm antenna such as a beam or a high-impedance antenna such as a folded dipole or a random wire. A separate coax connector is provided for 52-ohm 6-meter antennas.

Though the transmitter is normally crystal controlled, another switch will allow you to shift control to an external VFO – which you might buy from WRL as an accessory after landing your General Class ticket. Another convenience is the rear-apron socket, which provides connections to supply power to external accessories, apply power from an external supply for mobile use, and/or operate a send-receive relay to be actuated by the front panel "Transmit-Standby" switch.

And so you decide to purchase a 680, you spend several enjoyable hours carefully putting it together, and you are soon using the little rig to make contacts all over the world. But time marches on and things change. Sideband operation replaces AM, transceiver operation replaces separate transmitters and receivers, and the demise of the Novice ticket marks the decline of interest in 75-watt-and-under rigs.

Eventually, your trusty Globe Scout is set aside to collect dust on a basement shelf.



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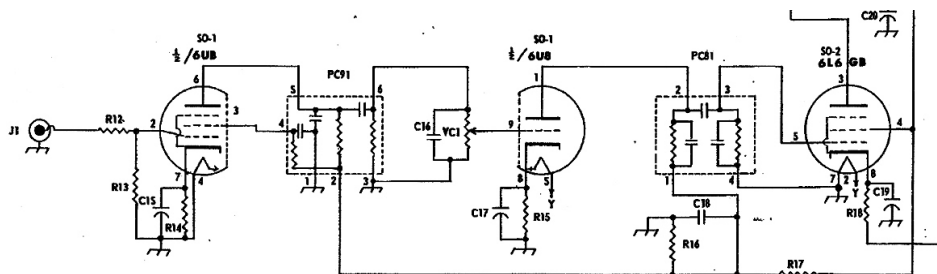


Compact, completely bandswitching transmitter for 6-80 Meters; allows operation of 6 M band by technicians and novices (CW), plus later use by advanced ham without becoming obsolete. Completely self-contained with built-in power supply, for 65 watts CW, 55 watts phone. Full modulation of Final. TVI-shielded cabinet. Pi-Net output on 10-80M; link-coupled output on 6 M, matching into low impedance beams. New-type shielded, full-range plastic meter for better readability. Adaptable for Mobile Operation.

\$99⁹⁵

GLOBE SCOUT 680 KIT, Complete with Detailed Instructions \$89⁹⁵

Globe Scout ad from a 1957 QST. Just \$10.00 more for the wired version? I guess WRL must have wanted to discourage kit sales.



The 680s audio circuits used a 6U8 pentode/triode driving a 6L6 modulator.

Now fast forward to the present time, when you decide to take the 680 to a radio meet and offer it for sale along with other obsolete items from your shack. It hadn't been on display very long when a certain restoration columnist from *Monitoring Times* spotted the item, smiled, and paid your reasonable asking price on the spot without so much as a haggle.

❖ The 680s Electronic Design

Up to this point my story has been fictional – except that I did, not so long ago, spot a Globe Scout on a seller's table and purchase it on the spot. Why was I so interested? Well I'd hardly be the *MT* restoration columnist if I didn't have a strong interest in vintage electronics. And as a radio amateur I'd long wanted to put a vintage AM rig on the air. Yes, the AM operating mode is still alive – kept so by enthusiasts who regularly fire up their old rigs and meet on prearranged frequencies.

Before we open up my '680 for a detailed examination, let's take a look at its electronic design. Fortunately, a complete manual for the kit version – which contains complete construction notes as well as the usual technical and operational notes – is available at bama.sbc.edu/. Click on WRL in the manufacturer list, then scroll down to find the link to the 680 manual.

I'd like to provide a complete schematic as we discuss the circuitry of this vintage transmitter. There's one in the manual but, to be readable, it would have to be run large enough to take up perhaps a third of this column. Instead, I'll run excerpts from the schematic showing most of the audio and r.f. sections.

These are not as sharp as I'd like them to be because the original scan wasn't perfect. You may not be able to read individual parts designations, but the reproduction should be good enough so you can follow my circuit overview. If you'd like to see the entire circuit, download

your own free copy of the manual from [bama](http://bama.sbc.edu/) (Boat Anchor Manuals).

The Globe Scout needs only four tubes plus rectifier to do its job. The audio and r.f. sections each use two tubes. In the audio section, the output of a crystal or high-impedance dynamic microphone is fed to the pentode section of a 6U8 tube, which serves as the speech amplifier. The output of the pentode section is capacity-coupled to the grid of the 6U8's triode section, which is the audio driver. It, in turn is capacity coupled to the 6L6 modulator stage.

The capacitor and resistor networks used to couple these stages are housed in sealed units called "Couplates." Manufactured by Centralab, these units were also known as "printed electronic circuits" or PECs and are a primitive form of modern printed and integrated circuits.

These certainly simplified the wiring process, but I worry about how well the resistor and capacitor equivalents inside the packages have retained their specs over the years. Luckily, a short browse on the internet turned up schematics and specs for the individual parts. If need be, I can put together replacement Couplate units made up of discrete components.

The 680 employs Heising modulation, which means that, in AM mode, the output of the modulator stage is coupled to the final r.f. stage via a choke (not shown). The r.f. stages are comprised of a 6V6 regenerative crystal oscillator, coupled to the 6146 final amplifier. A band switch selects coil taps in the 6V6 and 6146 plate circuits to access the 80- meter through 6-meter bands.

The final operates straight through on 80 and 40 meters, using crystals for those bands. 20, 10 and 6 meters utilize 40-meter crystals. On 20, the oscillator operates straight through and the final doubles. On 10, both the oscillator and the final double. On 6, the oscillator triples and the final doubles. On the 11-meter band, which is no longer available for amateur operation, crystals somewhat lower than the 40-meter band

were used and doubling was done both in the oscillator and final stages.

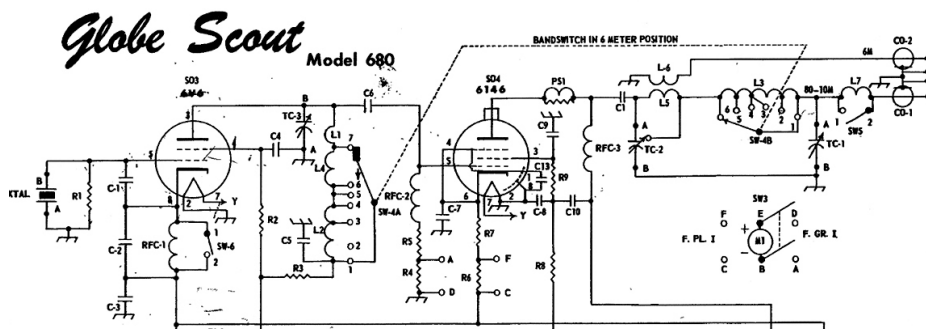
As has already been mentioned, the pi-network output circuit, consisting of tapped final tank coil L3 and capacitor TC-1, is switch selectable to feed either a 50- or 72-ohm antenna or such high impedance antennas as a random wire or folded dipole. A separate coaxial connector, wired to link L4, can feed a low-impedance 6-meter antenna.

Space doesn't permit showing the 680's power supply, but it utilizes a conventional, choke input, full-wave rectifier circuit that supplies 500 volts at 200 mA. The rectifier tube is a 5U4. Filament and plate voltages are brought out to an accessory socket on the transmitter's rear apron (not shown), as is a 115-volt circuit that is "hot" when the "Transmit/Standby switch is in the "Transmit" position.

This circuit can be used to control such functions as transmitter/receiver antenna changeover and receiver muting on transmit.

The plug that is normally inserted in the accessory socket has a jumper that completes the filament circuit. When it is removed, the internal filament supply is disabled and filament and plate voltage can be inserted, via a plug without a jumper, from a power supply for mobile operation. Alternatively the original plug can be used to take off filament and plate voltages for accessories, such as VFOs, to be used with the transmitter.

See you next time, when we'll pull my own Globe Scout 680 off the shelf and take a good look at it!



R.F. is generated by a 6V6 regenerative crystal oscillator driving a 6146 final. Power input was 65 watts CW, 55 watts phone.

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Kaito's Voyager: Ready for Your Next Emergency

By Ken Reitz KS4ZR

It tunes shortwave, AM, FM and Weatherband with NOAA Alert mode; it's powered by a built-in hand crank, rechargeable batteries or solar panel. It's positively "green." Wait a minute, it is green! It's Kaito's latest in an impressive line of emergency powered radios and, at \$69.95, it's cheap too.

❖ Radio or Recharger?

Kaito has specialized in low-end, innovative, multi-band radios for years. They've long included rechargeable Ni-MH battery packs in most models, thus saving millions of batteries from choking our already bulging landfills. They've designed shortwave radios with built-in MP3 players (the KA1121 - *MT* November, 2007), and offered a range of alternatively powered multi-band radios including their latest, the Voyager KA500.

The bottom line for Kaito seems to be the bottom line, and all of their products are cheaper than many "name brand" sets with comparable features. Yet, some sets, the KA1103, for example (*MT* April, 2007) are not only priced lower but outperform the name brands. How does the Voyager fit in?

Before looking at the radio part of this set, I'd like to explore the power features. First, the unit doesn't come with a typical wall-mount power supply, though one is available for \$14.95. Instead, they've designed four ways to power the radio: you can use three standard non-rechargeable AA batteries, a built-in Ni-MH battery pack (capable of being recharged hundreds of times), a hand-powered dynamo and a built-in solar panel. Recharging the Ni-MH batteries can also be done via your computer's USB port.

But, the unit is an emergency power supply, too. With a flip of a switch on the water-proofed connection panel on the back, you can use the hand-crank to power a cell phone (six popular phone connectors for Motorola, Samsung, Nokia and LG models are included), an iPod or any other similar product capable of being recharged. Instructions for properly charging these devices are found on the Kaito Voyager web page (www.kaitousa.com/KA500.htm). Being able to put a charge in your entertainment or communications when the power's down could make the Voyager worth the price.

Now, let's look at the radio. First, the seven NOAA WX frequencies are crystal controlled and sensitive enough to pick up a local NOAA transmitter from 30 miles away. This is really important for an emergency radio and the Voy-

ager performed well in this regard.

However, the rest of the radio suffered from various maladies. We're just so used to PLL receivers with digital tuning and precise displays that it's awkward to use a "by guess and by golly" analog tuning mechanism. In that sense, the radio part is as to be expected. The double conversion receiver is susceptible to interference and selectivity on all bands is poor.

Sensitivity on the AM band was greatly aided by a tunable AM loop antenna, but the poor selectivity made trying to tune out adjacent stations a pain. FM tuning was average, but again selectivity was an issue. The shortwave bands were thwarted by the tiny 14.5 inch telescoping whip antenna. But, attached to my 136 foot long, all-band, outdoor antenna, signals came in beautifully and the radio seemed to redeem itself. The audio was clear and undistorted and private listening via the included earbuds brought a higher level of fidelity than the built-in speaker could provide.

❖ Last Word

If you don't already have a reliable way to recharge your cell phones when the main power is down or when you're on vacation away from commercial power, you should really consider this unit. Think of the flashlight, reading light, WX radio, AM, FM and shortwave reception as a plus. If you're looking for a great portable shortwave radio to take on trips and don't care about charging anything but your credit card, the Kaito 1103 with its extensive shortwave coverage, digital display, PLL tuning and SSB capability is a much better bet, though higher



Kaito Voyager KA500 AM/FM/WX/Alert four-way powered portable. It has a three-way light system but no light for the dial. (Courtesy: Kaito U.S.A.)

priced (around \$90).

The Voyager is well built, rugged, and looks like it could take the abuse a trip to the wilderness might give it. I give Kaito high marks for continuing to be innovative in a radio market that most other manufacturers have given up on. And, if you don't like the green color, the Voyager is also available in black.

SPECIFICATIONS

Provided by manufacturer

Frequencies:

AM – 520-1717 kHz
FM – 88.0- 108.0 MHz
SW1 – 3.20-9.00 kHz
SW2 – 9.00-22.00 kHz
WX – All 7 standard NOAA WX frequencies with Weather Alert mode.

Features:

3" x 2" analog slide-rule dial
Built-in 14.5" non-swivel, telescoping antenna
Headphone jack
AC jack
In-out charger switch.

Lights:

5 small white LEDs on the back of the solar panel make a reading lamp.
1 large white LED on the end of the radio makes a flashlight.
1 red LED flashing beacon for emergencies.
Battery level LEDs: Hi (green) and Low (red)
Multi-function yellow LED indicates "charging" or "tuning" (signal strength).

Four-way Power:

Dynamo hand crank charges the built-in Ni-MH battery pack or the pack can be charged by a wall charger or your computer's USB port. Fully charged, the pack will power the unit for 12 hours. The unit can also be powered by the built-in, fold-away, adjustable solar panel. And it accepts three standard AA batteries (not included).

Accessories:

6 common cell phone charging tips
1 stereo earbud set
1 USB cord for connecting to your computer for charging or for powering other devices from the radio.

Dimensions: 8" W x 5.5" H x 2.5" D
Weight: 1.5 pounds (with re-usable and rechargeable batteries)
1 Year warranty on parts and labor.

Step Attenuator Kit

By Bob Grove W8JHD

Most readers know that an attenuator is a device, or circuit, that reduces the strength of a signal. On scanners, attenuators are often switched in to prevent strong-signal overload from nearby two-way radios, NOAA weather stations, and paging transmitters. Shortwave listeners occasionally resort to implementing an attenuator to reduce interference from nearby AM broadcasters, or adjacent-frequency international radio stations. This is usually the switch marked "DX" (maximum sensitivity for weak distant stations) and "LOCAL" (that's the attenuator).

But attenuators are also very useful devices for designing radio equipment, since it can experimentally reduce the signal levels in both receivers and transmitters between their various stages to determine the best compromise.

To be most useful, an attenuator should be adjustable. The new step attenuator kit from the Xtal Set Society is just such a device. By selecting the appropriate combination from among eight slide switches, the user can choose 1 to 81 decibels of attenuation in 1 dB steps. That's a considerable range with very fine tuning!

Originally designed for testing frequency selectivity of the large coils used in experimental crystal radios (that's right, the old galena and cat's whisker sets!), this step attenuator was only designed to operate from a few hertz up through several megahertz, but I've tested my unit with a spectrum analyzer, and it's amazingly flat well up to around 460 MHz!

As best as I could tell, the insertion loss is less than 1 dB well through the VHF range, with a narrow dip of a few dB around 162 MHz, which I attribute to a resonance from distributed

reactance in the layout. It does have a good ground plane below the component side of the board helping its uniform response.

❖ Building the Kit

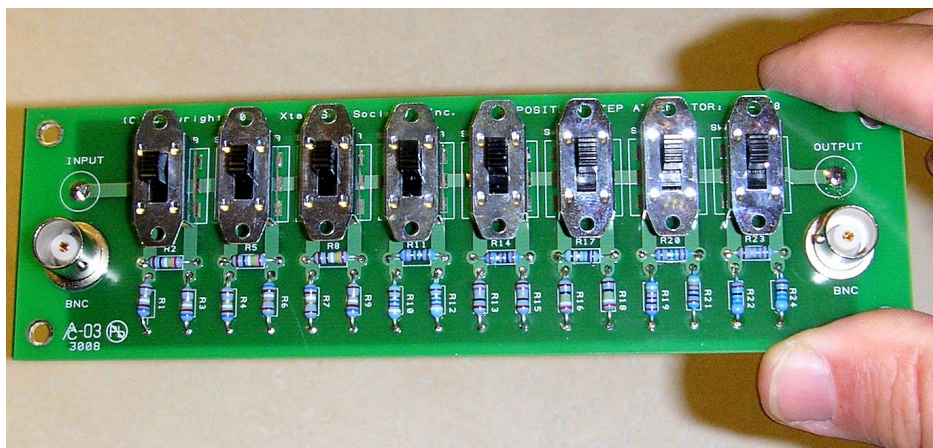
Well-packaged with professionally illustrated, step-by-step instructions, the step attenuator kit comes with 1% tolerance precision resistors, carefully separated and labeled for correct installation. It's hard to make a mistake. Experienced kit builders should be able to put the whole thing together in about 1-1/2 hours. That's what it took me, and I went very slowly, double-checking every step, so I wouldn't have to swap any parts after soldering them in place!

As shown in the accompanying photo, the input and output signals are via BNC connectors. The PC board is printed not only with parts call-outs, but with reference legends for the attenuation of each of the switches (20, 20, 20, 10, 5, 3, 2, 1 dB).

An interesting application article is included for the stalwart crystal radio builder who wants to design the best coil for his project. After all, that was the original purpose for this step attenuator!

While the board could certainly be mounted in a metal or plastic project box, it works just fine in its open style.

The step attenuator kit model XSS-SA8 is available for \$49.95, or the PC board alone for \$19.95, from the Xtal Set Society, PO Box 3636, Lawrence, KS 66046; phone (405) 517-7347. Visit their website at www.midnightscience.com or email xtalset@sunflower.com.



Propagation continued from page 18

Propagation on VHF and Above

Quite a bit of meteor shower activity is expected in November and December, providing conditions for meteor-scatter openings on the VHF bands for distances up to about 1000 miles. When a meteor burns up in the atmosphere, its intense heat creates an ionized trail, making it possible for radio signals to propagate off of the ionized trail much like they would off of the ionosphere. Look for the November Leonids starting around mid-November. After the Leonids, check out the Geminid meteor shower in mid-December. Both of these showers provide great opportunity to experience VHF DX via the plasma vapor trails left by the intense heat caused by the meteor as it burns up in the atmosphere.

Meteor scatter propagation is a mode where radio signals are refracted off of these trains of ionized plasma. Because the height of these plasma trains is in the E layer of the ionosphere, the range of a meteor scatter contact is between 500 and 1300 miles. The frequencies that are best refracted are between 30 and 100 MHz. However, with the development of new software and techniques, frequencies up to 440 MHz have been used to make successful radio contacts off of these meteor trains.

Lower VHF frequencies are more stable and last longer, off of these ionized trails. A six-meter contact may last from a second to well over a minute. The lower the frequency, the longer the specific "opening" made by a single meteor train. Conversely, a meteor's ionized train that supports a sixty-second refraction on six meters might only support one-second refraction of a two-meter signal. Special high-speed digital modulation modes are used on these higher frequencies to take advantage of the limited available time, like high-speed CW, in the neighborhood of hundreds of words per minute.

WRITE ME

Do you have questions about space weather and radio propagation? Do you have observations about Aurora, Sporadic-E, or Meteor Shower propagation that you would like to share? Please write me an e-mail message or a letter.

I also invite you to check out my propagation resource center (including discussion forums) on the Internet at <http://prop.hfradio.org>. If you have a cell phone or other handheld device capable of reading WML, I have a WAP version of this resource center at <http://wap.hfradio.org>. You can even sign up for my propagation eAlert service for free. These propagation eAlerts keep you informed of the various index numbers, in real-time. I wish you a happy radio-monitoring season!

73 de NW7US, Tomas Hood
NW7US@arrl.net
(PO Box 9, Stevensville, Montana 59870)



Tracking the Elusive FM HD Signal

By Ken Reitz KS4ZR

By now most *MT* readers will have experienced the great digital TV (DTV) shift from analog to digital off-air TV. To be charitable, the results have been mixed. Looming on the broadcast horizon is a similar shift that will occur in the off-air radio industry as both AM and FM broadcast stations shift from analog to the new digital frontier.

By anyone's standards, the TV transition was not a smooth one. While those living in or near cities have seen an improvement, those in the countryside are struggling to get back what they once had: decent reception. With any luck, the radio industry will learn from the mistakes of the DTV transition, but I wouldn't count on it. The one thing we've all got going for us is that the complete transition may be a long time coming. Industry sources indicate that a deadline for the radio switchover could be as far as 10 years away.

Right now, regardless of the official change date, HD Radio (originally known as IBOC, In-Band-On-Channel) is here and, in some places, flourishing. As of this writing there are currently 1,600 FM stations broadcasting in FM HD, half of which are multi-casting (transmitting auxiliary channels of music or information). There are far fewer AM stations transmitting an HD Radio signal and AM HD has its own peculiar problems so, for purposes of this article, I'll be looking at HD FM reception.

❖ Not Your Dad's FM Band

For those too young to know, the FM band was a totally different landscape 20 years ago. It was a time before the tens of thousands of translators and boosters, religion-based money-making machines, and low-power neighborhood-based community radio gobbled up every single frequency in nearly every market. Many could argue that all of those above have been a blessing to FM listeners, bringing a variety of voices and views.

But, from a listener's perspective, in many cases the program content on the boosters and translators merely duplicates programming already receivable from several other in-market sources. Instead, the translators and boosters can act as a guard against listeners in one market gaining access to different programming from a different market.

In my own location in central Virginia, it used to be possible to listen to nearly all of the FM stations in the Washington, D.C. market

with a large VHF-TV-FM antenna on a rotator. Today, transmissions from nearby translators and boosters now mask nearly all of those signals.

That set me to wondering, "Using the best FM antennas available, would it be possible to still tap into the out-of-market stations and enjoy reliable distant programming? If so, would I also be able to listen to out-of-market HD Radio programming?"

First, I would need a good HD Radio receiver.

❖ Best of the Rest

Throughout 2007 I wrote a series of articles and reviews about the current crop of HD radio receivers. The one thing they all had in common was the HD tuning section, the chipset that actually does the HD Radio tuning and displays the results on a nearly identical blue panel. There was a similarity that made it seem that, with rare exception, all HD Radio tuners came out of the same factory in China. The differences, among all of the receivers I tested, were the amplifier section, speakers, case, remote control capabilities and auxiliary features. (See the January 2008 summary www.monitoringtimes.com/mtfirstlook-hdroundup.pdf for Ken's comparison of all the HD models - ed.)

The best of the lot, as I judged them, was the Sangean HDT-1X, a stand-alone component receiver which not only had the most sensitive tuner but it had one feature I thought most useful for HD Radio reception: a fiber optic audio output that lets you use the capabilities of your surround-sound stereo for optimum sound, which is, after all, the whole point of HD Radio. Therefore, for this article I used the HDT-1X as the standard receiver to determine the maximum range of HD FM reception on a variety of FM antennas that I tested.



Winegard's HD6055P 10 element FM antenna (Courtesy: Winegard)

❖ Antenna Line-up

My research in HD FM reception from 2007 indicated that, regardless of the radio used, reception of HD Radio signals from greater than 30 miles away require the help of an outdoor antenna. One problem familiar to anyone who has done any FM DXing is that propagation on the band changes with the season, and it's possible to achieve some remarkable distance results even with modest outdoor antennas. But, such conditions are short-lived and what I wanted to know is, skip conditions aside, what is required to get reliable HD Radio reception from over 50 miles away?

To find out, I used a variety of FM DX antennas. The first antenna I used was a Winegard 10 element FM Yagi-Log periodic, with six driven elements on a 13 foot boom. Unfortunately, that antenna is no longer made. It's been replaced by the HD6055P (\$69 plus shipping) which is very similar.

The second antenna was an FM Yagi-Log periodic combo from Antenna Performance Specialties, the APS-13, that features 13 elements (six of which are driven) on a 17 foot boom. It's considered the premium FM DX antenna available, and at \$200 plus shipping, it should be.

The third antenna was a home-brew, stagger-stacked, FM Yagi quad array that used



Sangean's HDT-1X component HD Radio tuner was the standard tuner used in search of the best HD FM antenna. (Courtesy: Sangean)



Antenna Performance Specialties APS-13 is a 13 element Yagi-Log FM antenna on an 17' boom. (Courtesy: Antenna Performance Specialists)

four six-element antennas, each of which is on a six-foot boom. Cost of making this antenna was about \$100: \$20 multiplied four times for four antennas, plus \$20 for aluminum stock from a local hardware store to construct a boom and mast system for the array. The Winegard and APS-13 were mounted on a rotatable mast at about 25 feet above ground.

❖ Quad-array Construction

The quad array antennas were stacked two on a mast, one-half wavelength apart, with the top antenna placed a quarter wavelength ahead of the lower antenna and both stacks attached to an eight foot boom, which allowed one-half wave-length between tips of the side-by-side elements.

New mounting holes had to be drilled on



The home-brew, 24 element, stagger-stacked, quad array. First version featured an 8' long, 2 x 2 pressure treated boom that was replaced by an aluminum boom also 8' long. (Courtesy: Author)

all antennas to achieve the quarter-wave forward spacing and it was a little tricky holding the antenna in place so that it was 90° to the mast. Normal mounting hardware was able to hold the antenna, despite being off balance.

However, that made the entire array unbalanced, so that a special antenna mast mount had to be made to force the antenna to be 90° to the mast. I did this by cutting a 4" x 8" piece of 1/4" thick sheet aluminum stock that my neighbor happened to have. I drilled three sets of holes in the stock, using one set in the center to hold the boom to the mount and the other two sets to hold the mount to the mast. That did the trick and the array looks exactly at the horizon.

The first version of this antenna was made with a 2" x 2" pressure treated wood boom. The lopsided nature of the array made it so the array looked more into the ground than the horizon,

and the wood boom warped after only a few days.

That's when I made the 8-ft. aluminum boom using two 4-ft lengths of square tubing. I joined them with two 1-ft long lengths of thick 90° aluminum angle stock. The pieces of square tubing were joined and the two pieces of stock, one on top and one on bottom of the where the joint was made, were bolted together. The joint was strong enough to support the two arrays at each end.

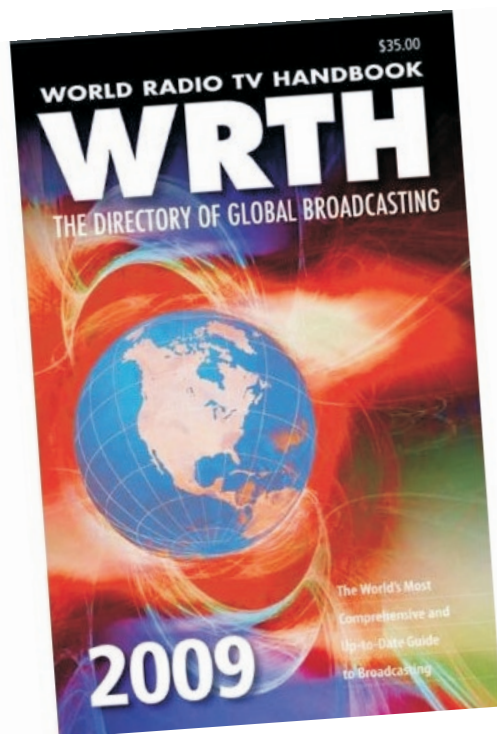
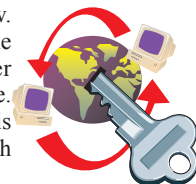
All four antennas were fed with a phasing harness made up of lengths of RG/6 coax, cut to within a half inch of each other, with the two leads for the top antennas having one-quarter wave-length extra length over the two bottom feeds. The ends of each lead were attached to 300:75 Ω transformers at each antenna.

The other ends were connected to a four-input antenna combiner, and the combined inputs were fed to a length of RG/6 down the antenna mast, underground to the house, and finally to the receiver.

The theory of the quad-stacked array is that you not only get more forward gain than

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with all the elements lined up on one boom, but the side-by-side arrangement reduces side-lobe interference. The stagger-stacking further reduces ingress of signals from the rear, which was of particular importance to me in reducing interference from translators and boosters operating on the same target frequency from the back of the antenna.

❖ To Amp or not to Amp?

One last note before testing the capabilities of the various FM DX antennas: Virtually



Winegard's AP-3700 mast-mount antenna pre-amplifier is for VHF frequencies. Make sure you don't engage the built-in FM trap! Available at retailers listed in this article. (Courtesy: Winegard)

all manufactured FM antennas are 300 Ω construction and require a balun (transformer) to change the impedance of the antenna to match the 75 Ω coax cable. The balun is attached directly to the driven element on the antenna, and the lead-in cable to the receiver can be attached here. But, if you're using a mast-mount preamplifier, you'll use a short length of cable to attach the preamplifier between the antenna and the lead-

in cable. The power supply (which sends a small operating voltage up the coax to power the preamp) is attached at the receiver in the house. I found that single FM antennas I tested benefitted from using such an amplifier, but that the stagger-stacked array did not.

❖ Tuning in the Real-world

Like most FM listeners, for many years I used a VHF-TV antenna as my main FM antenna. Since the entire FM band (88 to 108 MHz) is between channels 6 and 7 on the VHF-TV band, such antennas tune the FM band well enough for casual listening. But, such antennas are a compromise in which the FM band is mostly an afterthought, with the design intended to receive all frequencies in VHF-TV range, channel 2 through channel 13 (55-216 MHz). That's why a dedicated FM antenna is preferred by FM DX enthusiasts.

The VHF-TV antenna was on a rotatable mast at about 25 feet above the ground. After taking down the old antenna, I put the Winegard Yagi in its place and noticed that reception was greatly improved. Higher powered analog stations from 50-60 miles away were static free and in stereo. But, lower powered stations on the same frequency as higher power stations from the other direction could not be nulled out. Higher powered HD FM stations locked in for a constant signal and came through nicely. But, lower powered HD FM signals failed to lock for more than a few minutes, if at all.

The APS-13 provided even more improve-

ment. As expected, receiving stations in the 50-60 mile range was no problem. I had noise-free reception on all analog and HD FM stations. Analog signals from 90 miles away came in nearly noise-free while HD FM stations from that distance would lock in for several minutes to up to half an hour, depending on band conditions.

The test with the quad array proved to be somewhat of a problem. Because of the size of the array, there was no way to get it up to the FM antenna position on the rotatable mast without the use of a hoisting device to get around the side of the house. And, there was no way to take each component onto the roof and assemble it there. A separate mast had to be constructed. I sunk a 4 x 6-in 12-ft long, pressure-treated pole in the ground and attached a 10-ft length of heavy-duty mast, using house siding antenna supports to hold it to the wood pole. After doing that,

I mounted the antenna to the top of the mast and connected it to the coax using a ladder. Once the antenna was mounted, I could raise the entire array to 25 feet by slipping a series of 5-ft antenna masts under the last mast and pushing the whole thing up. Once it was in place, I could rotate the entire array by hand and lock it in the desired direction for tests.

The quad-stacked array outperformed the APS-13 in that those analog stations at 90 miles were noticeably quieter. But, the hoped-for rejection of interfering stations from the back of the antenna was not as pronounced as anticipated. And, HD FM stations in the 90 mile range wouldn't lock in for any more time than on the APS-13.

❖ More Experiments?

It would have been more useful to have the antennas at 50 feet (signal gain is doubled by doubling the height of the antenna above ground, up to a point). This would have particularly helped the quad array, but that was not possible in my case. It would also have been preferable to have the array on a rotor, because the narrow beam-width of the antenna requires more precise aiming for best reception.

At this point in the development of HD Radio, the FCC requires FM stations to operate the HD side of their signal at lower levels than their analog signal out of concerns for interference with adjacent analog signals. It's possible that, as the FCC allows higher power for the HD side, that those 90 mile HD FM signals could lock on permanently. On that issue, only time will tell.

One other problem I had with the quad array was the significant wind load in the design. While the AntennaCraft Yagis are well designed and durable, my home-made boom arrangement could have been better built. During a particularly fierce wind storm this past spring, the array took a nosedive into the surrounding woods. I was able to salvage the array, though a significant amount of repair work was required.

Both the Winegard and APS-13 antennas are designed extremely well; construction on both antennas make them very sturdy. They

SOURCES

Years ago, RadioShack carried the Antennacraft six-element Yagi FM antenna, but not any more. Instead, they carry a variety of VHF-UHF-FM antennas, as do other retail electronic stores. While these can be used, their extra size and elements make them less optimum for building an array.

However, there are still online retailers that carry the Antennacraft line. These Internet web sites carry all of the antennas mentioned in this article. Check for availability, pricing, and shipping charges. All three companies listed below carry a variety of FM antennas, mast-mounted preamplifiers, and coax cable.

www.solidsignal.com

Solid Signal 25225 Regency Drive, Novi, MI 48375 866-374-4625 (Mon. - Thur. 8:00 AM - 7:00 PM ET, 8:00 AM - 5:00 PM Fri, & Sat.)

www.starkelronic.com

Stark Electronic 444 Franklin Street, Worcester, MA 01604 508-756-7136 (Mon. - Fri. 8:30 AM - 5:00 PM ET)

www.summitsource.com

Summit Source 4203 Merchant Road, Ft. Wayne, IN 46818 260-489-7525 (Mon. - Fri. 8:00 AM - 5:00 PM ET)

both survived many wind storms throughout the past winter with no ill effect.

❖ Final Thoughts

Given the current broadcast conditions, the FCC's willingness to continue to issue more and more licenses for translators and boosters to current FM license-holders, the general crowding of the entire band, and the lower power allowed for FM HD signals, it's not likely that we'll know the full extent of the distances possible with HD FM DX for some time yet.

Meanwhile, here's a rule of thumb that might help you get better FM HD signals where you live. If you're currently getting full quieting on all FM signals in your area you'll likely not be affected by any switch to HD transmissions. If you are used to hearing a certain amount of "FM hiss" in the signals of your favorite stations, you'll likely have to upgrade your current FM antenna to something more substantial to tune the HD side. It's possible that all you will need is the Winegard and a preamp to do the job.

But, if you're already getting substantial noise in FM stations you're trying to listen to, you may have to resort to the APS-13. At \$200 it's actually quite a bargain when compared to the hours I spent building the quad array!

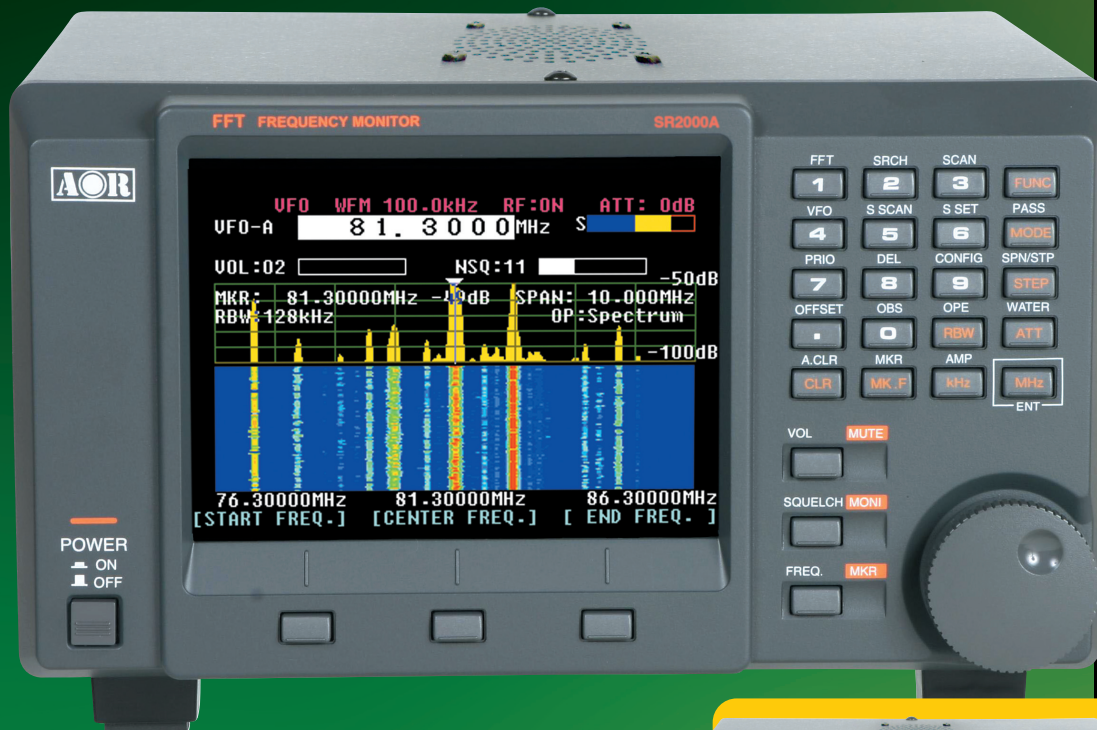
And, finally, there's this thought for anyone interested in what might be the ultimate FM antenna: Consider building a stagger-stacked quad array using four APS-13 antennas mounted on a 50-ft tower! The 52 element array would be huge and incredibly expensive - \$800 for the antennas alone - but it might deliver spectacular results. Just watch out for those wind storms!

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*Government version. Cellular blocked for US consumer version.

**No audio is available when the frequency span is set to 20MHz or 40MHz.

***No audio available while displaying video signal on the LCD. If both video and audio need to be monitored simultaneously, an optional (external) TV2000 is required.

“Fly” Your Radio Like a Fighter Jet!

About twenty years ago, fighter aircraft manufacturers finally listened to pilots and put commonly used controls (such as weapons selection, firing, radar modes and more) on the pilot's control stick and throttle. This became known as HOTAS, Hands on Throttle and Stick. Instead of wasting time searching their cockpit's panel for these often used functions, with HOTAS they were now easily accessed all in a cluster at their fingertips.

Don't be mistaken. A modern fighter jet still has a pretty complex panel(s) of switches. However, the important, often used ones are right on the joystick and throttle. So why shouldn't we control our radios in the same way? With the power and complexity of modern radio control software, even simple operations can take a bit of “command recalling.” And if you use two (or more) different control programs, your re-learning time can really cut into your radio enjoyment time.

❖ Joystick versus Keyboard

In the August column, we looked at using VR Commander, which allowed us to use voice commands to control our radio control software. Now, in our continued quest for simplicity, we will look at a program that allows us to use a joystick to control our radios. And, as an added bonus, it can be used with just about *all* radio control programs and more.

What is this seemingly magical program? This *free* program's name is “JoyToKey.” I first found mention of it on a flight simulator site forum, but I smelled radio potential. As its website describes, “JoyToKey is a keyboard emulator for joysticks (that) converts joystick input into keyboard input (and mouse input). You can use JoyToKey to control an application with joysticks that doesn't support joystick input.” Sounded just right for radio software.

In concept, JoyToKey is quite simple. It sits between your game (or radio software) and your PC's human interface. In our case, this will be a simple USB connected joystick. Then, via a very simple interface, the user creates a set of control “translations” for each command. It sounds more confusing that it really is.

Let's say we are using Ham Radio Deluxe and want to display the BandScope. This is can normally done by pressing four keys simultaneously, or three keys (Alt, T and B) in sequence.

But, using JoyToKey we can map these

three key presses to a single button on our joystick. Then, when we press that button, the BandScope will appear without the need for the dexterity of a concert pianist. Pretty nifty.

By mapping our most used radio functions to the joystick movements and button (such as frequency and mode changing), we will rarely have to go on a keyboard hunt. The result is less time searching for command keystrokes and more radio time, which can't be bad.

❖ JoyToKey's PC Requirements

JoyToKey version 3.7.4 will work with Microsoft Windows 98, ME, 2000, XP, XP, X64, and Vista. However, make sure that your system is using Direct X 6.0 or newer. The Direct X module handles the majority of the devices that interface to the operating system such as sound, video, and human interface devices (joysticks etc.). You can (and should) download the most recent version of Direct X at the Microsoft site www.microsoft.com/downloads. Somewhere on this page you'll find a link to download the current version of Direct X. Just in case, I suggest you make a new System Restore point (see Windows “Help” file for details) before you do anything.

We ran JoyToKey on a PC with a 1.6 GHz Duo Core T2060 CPU, 1.4GB of RAM with a Vista Home Basic operating system. But just for fun, I tried it on an old Pentium II laptop running Windows 98 and it worked just fine. I don't think the age of your PC will be a limitation, within reason, if you have Direct X 6 or newer installed.

JoyToKey version 3.7.4 download is a relatively small program weighing in at under 350kB. Even using a dial-up connection downloading is quick. Once downloaded, unzip it in a new folder labeled “JoyToKey” on your hard

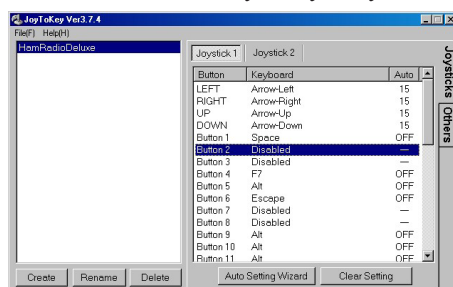


Figure 1 – JoyToKey deceptively simple screen. Notice we have created a Ham Radio Deluxe configuration (left).

drive using a program such as WinZip. The unzipped program occupies a paltry 650 kB of hard disk space.

In the new folder locate the **JoyToKey.exe** file and right click it. From the menu select “Send To” and finally “Desktop (shortcut)”. You will now have a JoyToKey icon on your desktop. Now run the program from this icon.

That's nice. But how do we create control/command translations for our radio applications? The answer, in a word is, easily.

❖ Making JoyToKey Our Own

OK, so now that JoyToKey is running, our next step is to set up a “Configuration File” for each of our radio applications. Let's stay with Ham Radio Deluxe (HRD). In Figure 1, using the “Create” button at the bottom left, we have created a Configuration File named “Ham Radio Deluxe.” This is listed in the box at the top left.

Select the “Joysticks” tab located at the top right of the screen, then Joystick 1. We currently have only one listed, an inexpensive and simple USB joystick. I think I paid \$9.99 for it. JoyToKey allows us to use up to sixteen joysticks... that's a lot of command buttons and motions!

If we were using a more sophisticated joystick with a POV (point-of-view) “hat,” switches, and more axis of motion, we would add a lot more capability than our basic \$10 joystick with only six buttons, two axis of control (X-Y), and a throttle control wheel (Z). Yet, watch as we make this basic joystick give us easy control of frequency, mode, screen display and more.

In JoyToKey we have two methods of customizing joystick commands. We'll use the “Auto Setting Wizard” at the bottom of Figure 1. Let's try something simple like making the joystick trigger switch (Button 2) press the “Enter” key. This will be useful in selecting menu items in Ham Radio Deluxe.

Using the mouse, we start by highlighting the “Button 2” line in the window under Joystick 1. Next, selecting the “Auto Setting Wizard” displays the box seen in Figure 2. Now press the “Enter” key on the keyboard and then “Exit.” The result will appear in the main screen window next to “Button 2,” which should now say “Enter.” You have just programmed your first joystick command! It's that simple and easy

In Figure 1, you may have noticed the other commands we previously programmed for Ham

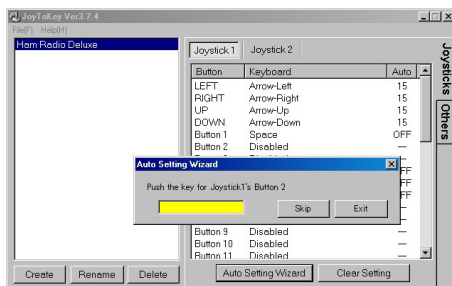


Figure 2 – Taking Control! Using the auto setting wizard to program the joystick's trigger (button 2) to produce an "enter" keystroke.

Radio Deluxe: Left, Right, Up, Down and a few Buttons.

❖ Getting Fancy

Now let's program another joystick to keyboard command for HRD using a different method. We'll try to display the Bandscope at the bottom of the HRD screen with a single push of button number 3 on the joystick. For multi-button presses we need to use the "Configure This Button" feature. Start at JoyToKey's main screen. Right clicking on the desired button visible under the Joystick 1 windows does the trick.

We really should first go to our target program and determine which commands we regularly use and their corresponding keystrokes. Many radio control programs have a keyboard command map in their Help file, which makes this job very easy.

However, some receiver control program commands may not have direct keyboard keystrokes. For these applications we need to use a multi-keystroke sequence. First get to the command line via the "ALT" key. Then navigate to the desired menu and finally go to the sub-menu and "target" command. This will usually get you where you want to go.

Armed with this HRD information, we open the "Configure This Button" by right clicking on "Button 3," shown in Figure 3. Here we can put a keystroke in each of the three boxes at the left.

Remember, we are attempting to open the Bandscope display with a push of Button 3 on the joystick. In HRD the "ALT" key will bring you to the command line and goes in the first box in Figure 3.

In box two we have placed a "T" which then opens the "Tools" menu. And finally, in the last box we have hit the "B" key. This sequence will display the Bandscope screen and is now "attached" to Button 3.

❖ The Joy(stick) Connection

Before we leave this screen, look at the "Automatic Shooting" slide control near the bottom. This determines how many times per second the keystroke(s) will be repeated. For our joystick movements (Up/Down) seen in Figure 1, we have chosen 15 "press" per second. This gives a reasonable digit increase rate when tuning our radio up or down. For this single action instruction, we have chosen to leave the repeat slider control at 0, or no repeats.

When we are satisfied with our settings,

clicking "OK" saves them. This procedure is repeated for each of the commands we wish to map to the joystick and its switches. This is the laborious part of the set up, but I think is well worth the small one-time investment.

❖ Using JoyToKey & HRD

This is what we trained for! Here goes. Open the JoyToKey program via the Desktop shortcut. Highlight "Ham Radio Deluxe" in the box at the left of the main screen. Minimize JoyToKey. It will appear as a joystick icon in your program tray at the bottom right of your Windows screen.

Now open HRD. Once the main screen is displayed, position your cursor on a blank part of the HRD window and left click. Your joystick should now be fully functional!

Remember, as in a fighter jet, not all controls are on the pilot's joystick, just the ones used frequently, such as change frequency, change mode, save contact, display digital signal decode screen, display BandScope, etc.

❖ My Most Used

If you look at Figure 1, you'll see how I programmed JoyToKey for HRD. The Left, Right, Up and Down I tied to the corresponding keyboard arrow keys. This makes frequency tuning very easy and moving from digit to digit just as easy.

Since I find myself changing modes often, I set the top of stick button (Button 1) to equate to pressing the spacebar. This will open the last used menu/function, which in my case is usually the Main Mode panel button.

The Up-Down joystick motions are used to highlight a mode. Then the "Trigger" switch (Button 2) actuates "Enter," selecting the highlighted mode. These movements can be used to navigate any HRD menu.

Button 3 opens the BandScope, while Button 4 opens the Add Logbook Entry screen. Button 5 brings the cursor to the command line, which can then be navigated by joystick motion. Finally, Button 6 closes any open screen or menu, bringing us back to the main screen.

Now we have run out of buttons on this basic joystick. But that's just my radio control tastes. You're free to do your own thing with JoyToKey.

With JoyToKey's multiple Configuration File approach you can set up a file for each of your receiver control programs. If you make your often-used commands the same joystick movements for every radio program, you will be able to move between programs with little to no re-learning. And you can program joystick buttons to move you between Configuration Files on the fly (another aircraft reference).

❖ Which Radio Programs Work with JoyToKey?

I tried JoyToKey with a number of radio control programs, including Talk Pcr, RadioMax, Ham Radio Deluxe and WorldStation and they all work quite well. Of course, the programs that provide the user with a keyboard command list are the quickest to set up.



Figure 3 – Another method. Using the configuration screen to program the joystick's button 3 to open HRD's bandscope display.

JoyToKey can also provide mouse emulation via the joystick. This can be accessed from the "Configure This Button" menu. However, I found that by using a joystick with one hand and a mouse with my other hand gave me more freedom and receiver operation options and had a real HOTAS-like feel.

❖ "It Would Be Nice"

In my "Never Satisfied" mode, the only modification I could suggest is a very small one. It would be nice if the Button-KeyBoard-Auto commands screen had an added user-definable field on each line. Here the user could give a brief description of what the command does in the specific program. But when you consider for how simple JoyToKey is to use and how great it works and it's for free ... I'll be quietly appreciative.

JoyToKey was very well behaved, easy to use, and operated perfectly. Although I used a cheap-and-cheerful joystick, I suggest you try one with a POV "hat" and possibly a "twist" added dimension. This will provide many more command opportunities, especially for transceiver operations. JoyToKey can also be used for your games and everyday applications.

JoyToKey, a *free* program, is available at www.softpedia.com/get/Tweak/System-Tweak/JoyToKey.shtml.

There are commercially available programs which do a similar job to JoyFor Key. I tried one that costs about \$20 and it messed up the page scrolling features of my mouse, requiring a re-boot. So why pay for one when JoyToKey is free AND well behaved?

Ham Radio Deluxe is also free of charge at www.ham-radio-deluxe.com/. Donations to HRD are always welcomed.

❖ Can Lazy Be Good?

Many years ago, a Math professor, Dr. Shea, commented on my laziness to the class. He said, "Catalano is so lazy that he always find the simplest methods of solving complex Math problems." Some things never change.

As we are given greater power with each generation of personal computers, just like the modern day fighter pilot, we need newer and simpler methods to control that power. JoyToKey does just that.

Keep searching for new methods and I'll do the same. Till next time ... Uh oh, I think I just shot down the station on 14.210 MHz with my joystick!

What's NEW

Tell them you saw it in Monitoring Times

Uniden Updates Handheld Scanner Lineup

Uniden America Corporation recently announced two new handheld Trunk Tracker III and Trunk Tracker IV scanners to be debuted in early 2009.

"Uniden is making major advances in the category it created," said Paul Opitz, Uniden's Scanner Product Manager. "We've listened to our customers and taken these scanners to the next level of functionality and performance based on what they told us they needed to do their jobs better."

The BC346XT will replace the BC246T as Uniden's flagship handheld analog Trunk Tracker. Touting 9,000 channels and organized using Uniden's own dynamic memory model, the BC346XT simplifies scanner programming by modeling the scanner's memory organization after the real world.

The BC346XT also adds Global Positioning System (GPS) support for automatic control of radio features based on location, a first in the industry for a handheld scanner, and a feature Uniden pioneered with the last generation of mobile scanners.

Additional features include:

Trunk Tracker III – follows trunk traffic on Motorola, Logic Trunk Radio (LTR), and Enhanced Digital Access Communications System (EDACS) systems (including EDACS systems using EDACS System Key or ESK).

500 Talk Group Identification (TGID) Channels per trunked system – doubling the number of channels that can be programmed into a trunked system.

Temporary Lockout – allows a channel or system to be locked out for a single session and restored by cycling power.

100 System/Site Quick Keys – provides a way to quickly turn on or off scanning for groups of systems...a feature that provides users of Uniden scanners the most flexibility in programming and operation.

Startup Configuration Keys – lets specific systems be locked or unlocked automatically when the scanner is powered on.

System/Channel Number Tagging – makes it easy to jump to a specific channel.

Multi-site Systems – in-

cludes support for large systems such as those being installed for statewide operation in some areas.

Priority ID Scan – lets the scanner apply priority to channels as they become active on the system.

Preemptive Priority (Motorola trunk systems only) – monitors for priority traffic, even when the scanner is receiving a transmission on the system.

Assignable Search Keys – give quick access to favorite search modes.

IF Exchange – lets the scanner use an alternate IF (intermediate frequency) to help avoid interference sources.

Negative dropout delays – resume scanning after the selected time to keep the scanner from hanging on stuck mics or other continuous transmissions.

Close Call® Temporary Store – buffers the most recent Close Call hits and scans them conventionally.

Location-Based Scanning – when a compatible GPS unit is connected, turns on and off systems, sites, and channel groups as the location changes.

Location Alert Systems – allow location-specific alerts to be programmed for such things as dangerous intersections, dangerous roads, or general points of interest.

Band Scope – gives a rapid graphical display of the strength of signals within a specified range of frequencies.

Key Safe Mode – prevents naïve users from accidentally changing programming. It is a feature that has been a request from public safety and media radio system managers.

Private Systems – prevents a system from being modified or read by PC, to help protect confidential radio system programming.

Control Channel Data Output – allows the analysis of control channel data without the need to perform invasive modifications to the scanner

Volume Offset – lets individual channels be programmed with a volume offset to help balance between channels that are louder or softer than other programmed channels.

EDACS ESK Tracking – tracks systems that have implemented EDACS System Keys

Fire Tone-Out Tone Search – identifies tones used by agencies using two-tone paging for alert signaling.

The BCD396XT will provide the same enhancements to Uniden's Trunk Tracker IV flagship handheld platform that are mentioned above. In addition, this new model adds:

Trunk Tracker IV – follows trunked traffic on APCO 25, Motorola, LTR, and EDACS systems (including EDACS systems using ESK).

A whopping 25,000 total channels

NAC Decoding – decodes Network Access Codes (NAC) used in association with digital voice modes and allows specific agencies to be monitored on P25 conventional channels.

P25 One-Channel Trunking –

supports P25 conventional systems that include both NAC and TGID access control on a single frequency.

Automatic P25 Threshold – fully automates the optimization of P25 reception.

Multicolor Display Backlight – allows the selection of backlight color to meet the user's own aesthetic taste.

Visual Alert Notification – lets alerts be assigned to specific display colors, flash patterns, audible tones, and volume levels.

Both models are expected to be released in early 2009 at prices comparable to the models being replaced.

Editor's Note: As of press time, these models are still under development, so all features are subject to modification or removal based on actual development and testing results.

AOR Releases New Handheld

AOR® has released a new handheld scanner, the AR-Mini. This unit has a water resistant (protects against spray and splash) case. The unit covers 100 kHz to 1299.995 MHz and includes the following receive modes – AM, Wideband FM and Narrowband FM.

Some of the major features included with this unit include:

Long Battery Life – Approximately 22 hours of operation on supplied Ni-MH batteries

Battery save function, auto power off timer

Low battery indicator

1000 memory channels (10 banks of 100 memory channels)

RF attenuator

Two VFOs

CTCSS and DCS decoding

Priority channel watch

Memory channel skip

Automatic or selectable tuning steps

Pre-programmed bug detector frequencies

(with level beep)

Earphone cord antenna capability

Built-in ferrite bar antenna for AM/LW frequencies (100 kHz-5 MHz)

LCD signal meter

TCXO for greater stability (+/-2.5ppm)

Cloning capability (AR-Mini to AR-Mini or through PC)

Free memory management PC software (via download)

Monitoring Times will be reviewing this unit in an upcoming issue. The unit will retail for \$299.00.

Books and equipment for announcement or review should be sent to What's New, c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Larry Van Horn, larryvanhorn@monitoringtimes.com



QRZ.com to Launch New Service

QRZ has launched a new service designed especially for web-enabled PDAs and Smart Phones. This gives users fast and convenient access to QSL information wherever cellphone coverage is available, 24 hours a day.



The new service provides access to the QRZ callsign database that is optimized for the small screens found on most web enabled phones. The callsign data is presented in a simple text style with no images, graphics, or biography data – just callsign data.

This service will eventually become a standard part of the QRZ Premium Subscription and will also be made available as a separate membership add-on for a modest fee.

Right now, however, the service will be free during the initial testing period. Go to www.qrz.com/pcs to check out this new service. A QRZ username and password are required, but no subscription is necessary during the testing period.

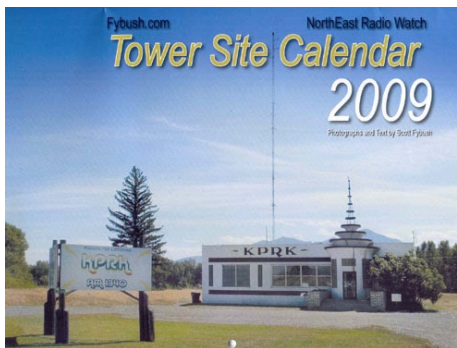
To access the system you will need a PDA or Smart Phone that is web enabled.

Radio Calendar Now Available

2009 will mark the fifteenth anniversary of NorthEast Radio Watch – and it's the eighth year for their annual *Tower Site Calendar*, now a staple of engineering offices, transmitter shack walls and DX shacks all over North America and beyond.

The Tower Site Calendar 2009 features 14 full-color, high-quality images of transmitter sites from all corners of the US and Canada. The calendar cover model this year is KPRK, the "Model Radio Station" of Livingston, Montana – and inside, you will have tower pictures from WNYM/WWRV in New Jersey, KNBR in San Francisco, CFFX in Kingston, Ontario, WQXR (er, WQEW) in New York, and WCFL (er, WMVP) in Chicago.

Additional pictures included with this calendar include the Crown Point tower farm in Omaha, the tall towers of the Shoreview "Telefarm" in Minneapolis, WDZK in Connecticut WRCE in Watkins Glen, New York, KEX in Portland, KSL in Salt Lake City, KXEL in Waterloo, Iowa and WGY in Schenectady.



The 2009 calendar is sent via first-class mail, shrink-wrapped for protection and with a cardboard insert to keep it from bending. The cost is \$18.00: make checks payable to "Scott Fybush." Be sure to include sales tax (8%) for New York state calendar orders, and send your order to 92 Bonnie Brae Avenue, Rochester NY 14618.

If you're ordering from outside the U.S. and Canada, send e-mail to calendar@fybush.com for additional ordering details, since shipping costs vary depending on where you're located. You can get additional details or place your order online at www.fybush.com/calendar.html

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Interested? Contact Editor Rachel Baughn at editor@monitoringtimes.com or write 7540 Hwy 64 West, Brasstown, NC 28902.

Correction

In the October issue of *What's New*, the mailing address to order the new International Callsign handbook should read, Teak Publishing, P.O. Box 297, Brasstown, NC 28902.

Books by Ernest H. Robl:

THE BASIC RAILFAN BOOK

UNDERSTANDING INTERMODAL

THE POWDER RIVER BASIN

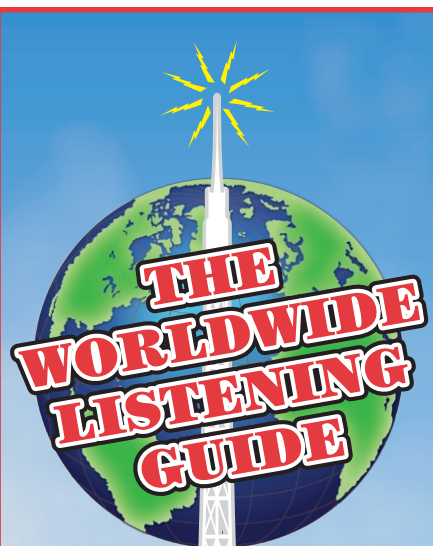
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Blogs offer an opportunity for columnists to share information that does not make their columns. The news might be too timely for deadline, too short, confined to a small geographical area, too far away to be heard in North America, or even off the columnist's regular "beat." Bookmark these blogs for frequent visits!

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